Three-Phase FR-UK Series UPS

(10-160 kVA)

User's Manual

【Note】

Please carefully read the user's manual before operation for the sake of understanding correct operation of the equipment. Please keep the manual handy for reference.

WARNING
The input and output of the instrument is with danger high voltages which may endanger the safety of life. Please strictly follow the operating description is not allowed to remove the cover of the instrument.

1. Please connect protective earth before power supply cables.
2. The input & output voltage of the UPS is dangerous which will endanger the safety.
3. Dangerous voltages are present inside the unit. Please do not open the cover of the UPS.
4. Please turn off the mains input switch and the battery switch for any urgency.
5. There are many kinds of power sources in the equipment, the line bank or the socket may still have dangerous voltage even if the main power is disconnected.
6. Please remove the cable between the battery & UPS before repairing. It's necessary to wait for another 5 minutes for discharging, because of the dangerous voltages.
7. The wires should be fastened to the terminals. It is prohibited to short the anode and cathode of battery. It's prohibited to touch any two of wire connectors or bare end of connecting wires. Otherwise, it may lead to damage of battery or personal injury.
8. Please keep the battery away from the fire and all the equipment that may cause spark to prevent the danger and damage.
9. Please do not open or shatter the battery, the overflow electrolyte is with causticity that may be harmful to life.
10. Please contact the professional personnel of the local dealer or the special maintenance station for any trouble-shooting. Random disposal of the trouble is not allowed.
11. This is an A-grade product with electromagnetic compatibility.
12. This equipment must be installed and serviced by qualified personnel.
13. Before you replace the battery of different brand and different type, make sure the charging voltage is matching with UPS charging voltage due to the different required charging voltage of different battery, If any doubt, please consult with the manufacturer. Any changes of the system configuration, structure and composition will influence the performance of UPS, please consult with the manufacturer in prior before doing any changes.
14. Before usage, confirm that the temperature of the instrument has dropped into the normal run range. It is recommended still placement for 24 hours in the normal temperature range before startup.

Product Standard：Q/ZZKJ001-2008

INDEX

1. Overview 1
1.1 Brief Introduction 1
1.2 System Features and Advantages 1
1.3 Configuration 3
1.3.1 Basic Configuration 3
1.3.2 Operation Modes 3
1.3.2.1 Utility Mode 3
1.3.2.2 Battery Mode 4
1.3.2.3 Bypass Mode 4
1.3.2.4 Maintenance bypass mode 5
1.4 Hot standby system 5
1.4.1 Basic Principle 5
1.4.2 Working Engineering 5
1.5 Parallel System 7
1.5.1 Basic Principle 7
1.5.2 Working Engineering 7
1.6 The Choices of Parallel System and Series System 9
1.7 Principle Machine Structure 9
1.7.1 Display Structure and Display Interface of Three-Phase（10~30 kVA）UPS 9
1.7.2 Display Structure and Display Interface of Three-Phase（40~160 kVA）UPS 11
1.7.3 Outlook of three-phase UPS FR-UK series（10~30 kVA） 12
1.7.4 Outlook of three-phase UPS FR-UK series（40~60 kVA） 13
1.7.5 Outlook of three-phase UPS FR-UK series（80~160 kVA） 14
2. Physical Specification 15
3. Installation for UPS 19
3.1 Installation instruction 19
3.2 Installation Steps 19
3.3 Preparing for Installation 20
3.3.1 Check the installation site 20
3.3.2 Unpacking and Inspection 24
3.4 Equipment Installation 25
3.4.1 Installation Notes 25
3.5 Check the main input 25
3.6 Installation of UPS 25
3.6.1 Installation steps of three-phase UPS FR-UK Series (10～30 kVA) 25
3.6.2 Installation steps of three-phase UPS FR-UK Series (40～160 kVA) 27
3.6.3 The structure of base plate of three-phase UPS FR-UK Series (10~160 kVA) 29
3.7 Battery Cabinet Installation 30
3.7.1 Important safety rules 30
3.7.2 Installation step 30
3.8 (Parallel) System installation 31
3.9 Electrical connection 31
3.9.1 Wire modes of single UPS 31

3.9.2 Method of Connection for the two units of UPS by Hot Standby System. 33
3.9.3 Connecting way of Parallel System 37
3.10 System Inspection and testing 40
3.10.1 Check electrical connections 40
3.10.2 UPS testing 40
3.10.3 Connect with the load 40
4. Operation 41
4.1 Notes of using UPS 41
4.2 UPS single unit operation process 41
4.3 Operation instruction 41
4.3.1 Inspection before power on 41
4.3.2 Single Unit Bootstrap procedure of Three-phase UPS (10~160 kVA) 42
4.3.3 Start the load 43
4.3.4 Turn Off UPS 43
4.4 Operating procedure of Parallel System 44
4.4.1 Parallel System Start-up 44
4.4.2 Parallel System Shut Down 45
4.4.3 Online shutdown Parallel System 45
4.4.4 Online start-up Parallel System 45
4.4.5 Redundancy and Expansion of Parallel System 45
4.5 Manual bypass Maintenance Operation Process 46
5 Maintenance Instructions 47
5.1 Maintenance Guide 47
5.1.1 Safety Precautions 47
5.1.2 Regular Maintenance 47
5.2 Daily maintenance of battery 47
5.3 Attentions when replace batter 48
5.4 Troubleshooting 48
5.4.1 FAQ 48
5.4.2 Troubleshooting for single system and parallel system 49
6. Panel LCD Display Operation Procedure 51
6.1 Push Key Function Illustration 51
6.2 On/Off Operation 51
6.2.1 On/Off Operation of Three-phase (10~30 kVA) UPS 51
6.2.2 On/Off Operation of Three-phase (40~160 kVA) UPS 51
6.3 Display and Related Operation 52
7 Communication Interface Connection Way 62
7.1 RS232 Communication 62
7.2 RS485 Communication 62
7.3 Dry Contact Communication 62
Appendix A 64
Package, Transportation and Storage 64
A.1 Package 64
A.2 Transportation 64

A.3 Storage 64
Appendix B 65
Toxic and Hazardous Substances or Elements Table 65

1. Overview

1.1 Brief Introduction

This series is true sine wave on-line UPS with high performance, adopting advanced technique to protect PC, communication device, electric machine, medical equipment etc. from disturbing or losing data from power failure. This series product can be use to resolve all kinds of power problems such as power interruption, voltage fault, electronic noise, peak, instantaneous voltage fall, lighting, instantaneous voltage fluctuation, frequency fluctuation etc.

1.2 System Features and Advantages

True double conversion on line UPS

Complete isolation at input/output by transformer, and adopting high efficiency IGBT power module for a real settlement on lighting, voltage between neutral and ground, all kinds of pulse and disturbance in power network supply a safe operating environment for equipment.

Digital DSP Control Technology and None-Principle-subordinate self-adaptive parallel Technology

The invert control, synchronous phase, input rectifying control, and logic control etc. are all controlled by DSP, as the control is with high precision, high speed, and high whole system performance.

Digital no-principle-subordinate self-adaptive parallel technology makes it true that this product can be paralleled multi-machine, realizes reliability redundancy of the UPS, ensures high requirements of information equipments to power supply quality.

Full function LCD display interface

Large LCD display panel displays the operation status and parameters with rich display content; and can record the history parameter for maintenance.

Compatible the load with unbalance 3 phases

Adopting 3 absolutely independent full bridge inverter, the separate control circuit design, so 3 phase output allow 100% unbalance load. There is not interaction between each phase, increasing the inverter reliability.

Flexible network supervising

This series can realize the intellectual supervising UPS and PC by RS232, SNMP and independent remote monitor. It is convenient for user power management including 1 to 1 single monitor and 1 to N multi-monitor.

Manual bypass maintenance design

Design bypass maintenance channel to assure the maintenance on machine without load power break.

Reliable EMC features

Passed the authority institution and company test on EMC, including conducting disturbance, radioactive disturbance, conducting anti-disturbance, radioactive anti-disturbance, power fault, mass impulsion, static discharging, surge etc. The predominant EMC features can be applied to high frequency communication, broadcasting audio and video system.

Wide voltage input range

Strong adaptability for power network can be applied to different voltage range.

Owns DC startup function

Allow start up by battery without utility power to facility user operation.

Intellectual battery charging and test

Patented intellectual battery management technique and professional managing design on battery charging and discharging improve the battery reliability and validity. The automatic test on battery also reaches above target.

Redundancy design for key circle

The work power of system adopts standby redundancy design, which enhances the reliability of system.

Intellectual Fans control

Fans can adjust rotate speed in accordance with the loading status to prolong fans life and lower noise.

1.3 Configuration

1.3.1 Basic Configuration

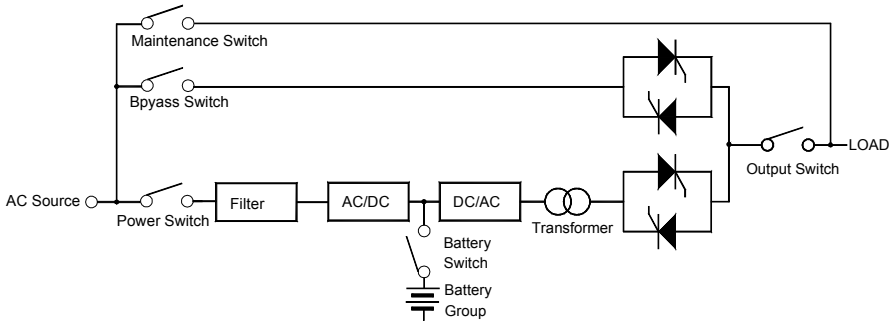


Fig. 1-1 UPS Basic Configuration

This UPS includes: Input Breaker, Input Filter & Protection Circuit, Rectifier, Inverter, Static Switch, Bypass Breaker, Isolation Transformer, Output Filter & Battery group etc. as shown in Fig. 1-1. This UPS system is full digital DSP control online uninterrupted system. When the utility is normal, AC power goes through filter and rectifier then change to DC power to inverter for charging the battery, which can be supply pure power to load at no transfer time.

1.3.2 Operation Modes

This system includes four operation modes: utility mode, battery mode, bypass mode and maintenance bypass mode, shown as following.

1.3.2.1 Utility Mode

As shown in Fig. 1-2, at the status of the utility normal, the rectifier changes the AC power to DC power to inverter and charging the battery. Through the process of AC power changed to DC power, the inverter can supply more reliability and pure power to load, as the rectifier can dispel the problems of the portent, noise, unstable frequency and so on.

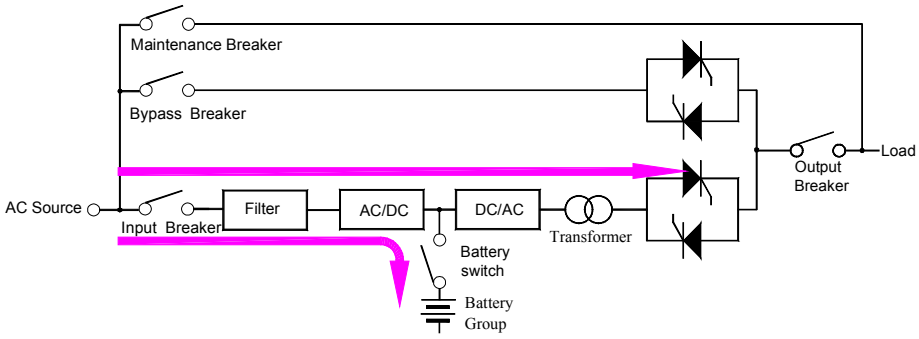


Fig. 1-2 Utility Mode

1.3.2.2 Battery Mode

As shown in Fig. 1-3, when the utility is abnormity, the battery connected to DC BUS will supply power to inverter, to protecting load from AC power interrupting.

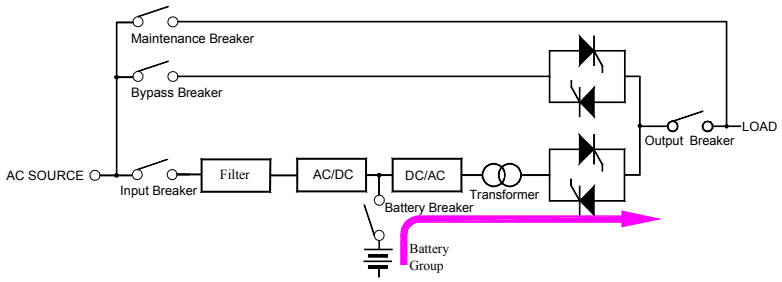


Fig. 1-3 Battery Mode

1.3.2.3 Bypass Mode

As shown in Fig. 1-4, when the inverter is failure (such as over-temperature, short current, output voltage abnormity, overload and so on), the inverter should shut off automatically. If the utility is normal at this moment, the switch will switch to bypass power to supply power to load.

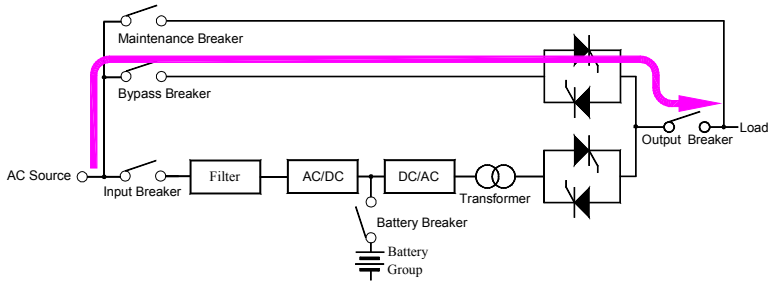


Fig.1-4 Bypass Mode

1.3.2.4 Maintenance bypass mode

As shown in Fig. 1-5, when you are maintaining or changing the battery, and the power must not be interrupted, you can shut off the inverter, and turn on the maintenance breaker, then turn off the rectifier and bypass breaker. At this mode, AC power goes through maintenance breaker to supply power to load. And at this time, there may be no any electricity in the UPS inside except the output transformer, and the maintenance personnel can work without any angst.

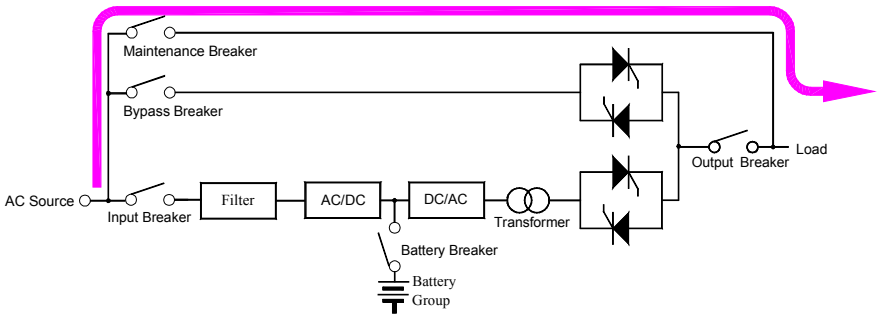


Fig. 1-5 Maintenance Bypass Mode

1.4 Hot standby system

1.4.1 Basic Principle

Change the master machine bypass input connection with utility to with slave machine UPS output. It is hot backup in series.

At master machine fault, it will switch to bypass automatically. At this moment, slave machine output will burden load, and load is still in UPS inverting protection. So equipment runs well as usual. If master machine stays in bypass and the slave machine stay in fault, the utility will burden load.

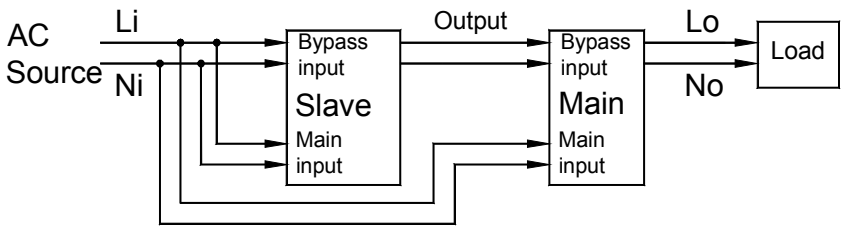


Fig. 1-6 Principle Diagram of Hot Standby System

1.4.2 Working Engineering

While working properly, main UPS supplies power to th load and standby UPS idly runs hot standby system. As shown in Fig. 1-7, thick lines refer to the power passage of hot standby system

Caution：：

1. the two units of UPS by hot standby connection mode shall not share one battery pack, instead, they shall have separate battery packs

2. The AC input(U,V,W,N when three-phase) of main UPS, the bypass input of standby UPS (L,N) and the AC input (U,V,W,N when three-phase) of standby UPS should be from the same utility (U,V,W,N when three-phase), at the same time, the order of phase must be consistent. When it is three-phase the bypass input (L,N) should be connected to utility(V,N).

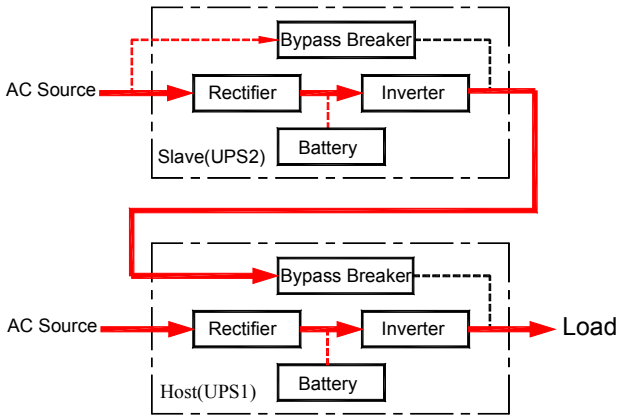


Fig. 1-7 Power Flow Chart of UPS Hot Standby in Normal Condition

In case of main UPS failure, the main UPS is switched to bypass status and standby UPS supplies power to the load. As showed in Fig. 1-8, the thick lines refer to the power passage of hot standby system in case of main UPS failure.

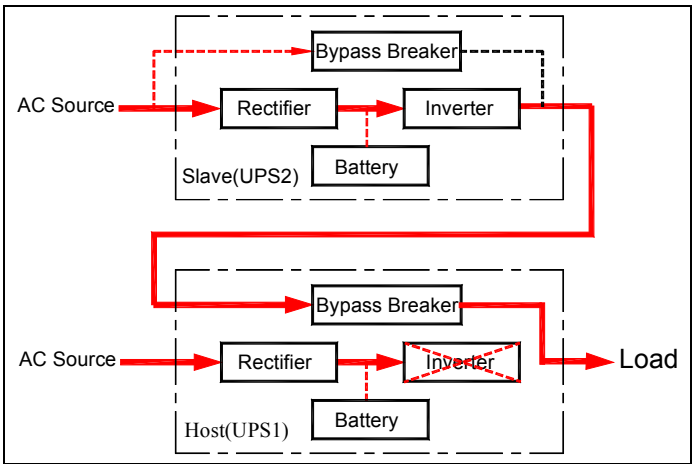


Fig. 1-8 Power Flow Chart of Hot Standby System in case of UPS1 Failure

1.5 Parallel System

1.5.1 Basic Principle

The realization of parallel current sharing of AC power is primarily through rapidly adjusting the waveform, amplitude and phase position of AC output of paralleled single machine, to make them strictly consistent and achieve the purpose of current sharing. Because the interference of power part of high power UPS itself may be larger, parallel system will need to have stronger anti-interference feature, to guarantee the credible operation of the system.

1.5.2 Working Engineering

Input terminals of each UPS should be connected to the same mains supply, their phase must be correspondence completely, and output terminals(U、V、W、N) of UPS must be connected paralleled with corresponding phase. So they make up a parallel standby system. When one of UPS in the parallel system is fault, it will be pulled out the system automatically, and the other UPS should support load.

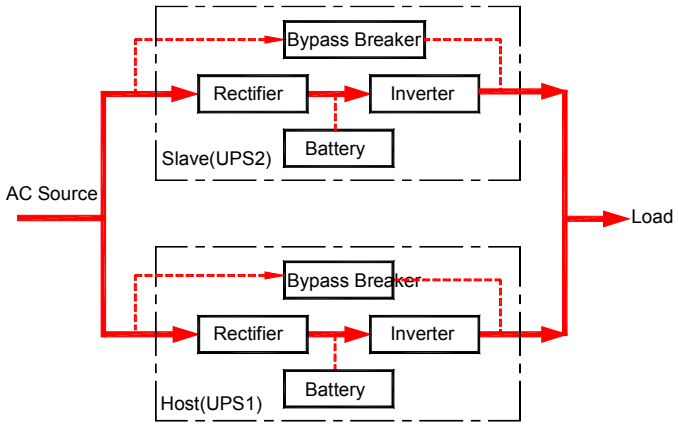


Fig. 1-9 Principle Diagram of Parallel System

The paralleled unit has independent bypass. 2 UPS could be paralleled directly without parallel control cabinet and other common bypass input. It's easy to install and maintain.

There is four kinds of working engineering

1. Working mode when main power is normal (real line is the energy flow of UPS), shown as Fig.1-A.

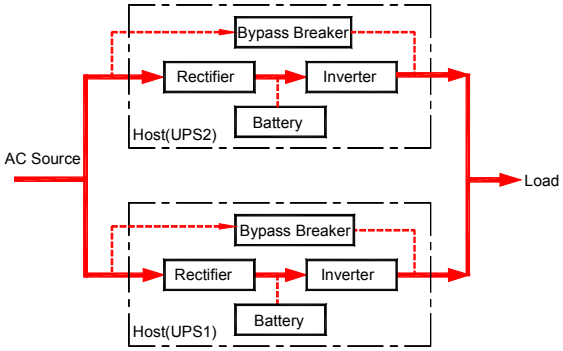


Fig. 1-A Working mode on normal main power status

2. Working mode when main power is abnormal (real line is the energy flow of UPS), shown as Fig.1-B.

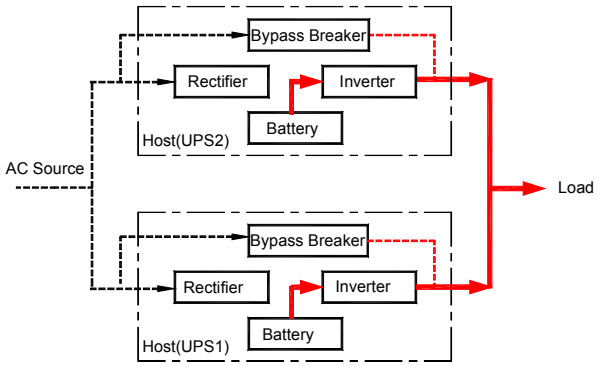


Fig. 1-B Working mode on normal main power status

3. Working mode when system is overloaded (real line is the energy flow of UPS), shown as Fig.1-C.

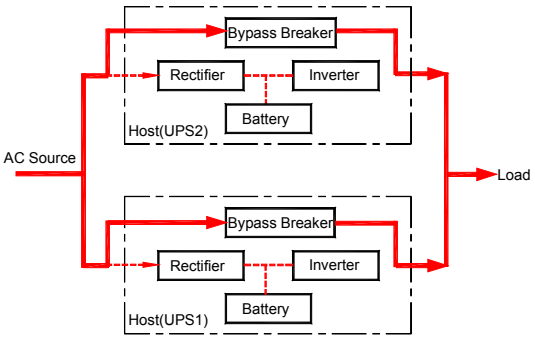


Fig. 1-C Working mode when system is overloaded

4. Working mode when one machine is abnormal (real line is the energy flow of UPS), shown as Fig.1-D. Abnormal machine is without output, normal machine provides energy to loads.

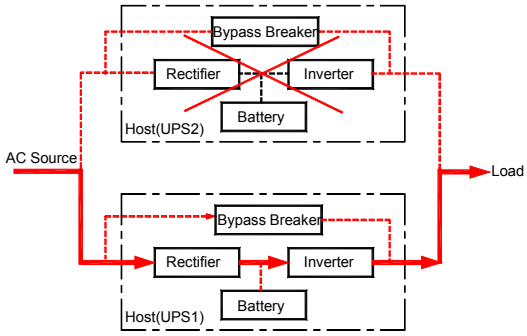


Fig. 1-D Working mode when one machine is abnormal

1.6 The Choices of Parallel System and Series System

The required capacity of user is smaller, which is no need to expanded, but when improving system credibility is required, series or parallel system could be chosen. When the required capacity of user is larger, which needs to be expanded, choose parallel system commonly. The parallel system could realize random N parallel expansion or N+1 redundant parallel, which improves the credibility of system greatly. Paralleled unit could online input or exit randomly, to realize the online hot maintenance of parallel system.

1.7 Principle Machine Structure

1.7.1 Display Structure and Display Interface of Three-Phase（10~30 kVA）UPS

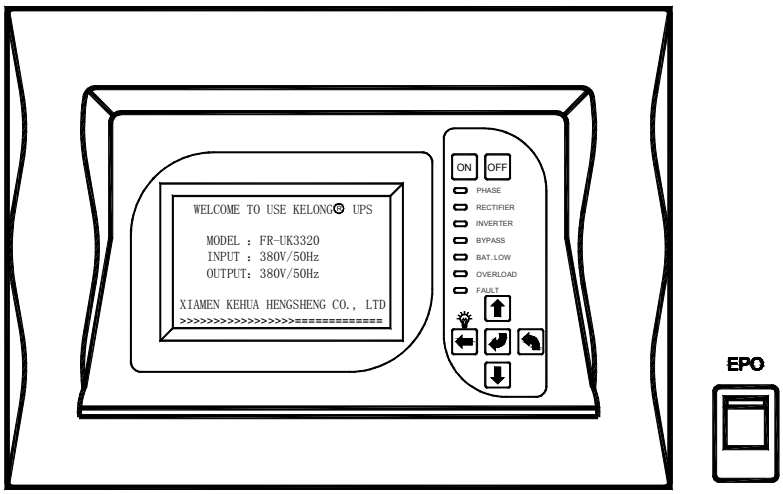


Fig.1-E Display panel structure of three-phase（10~30 kVA）UPS

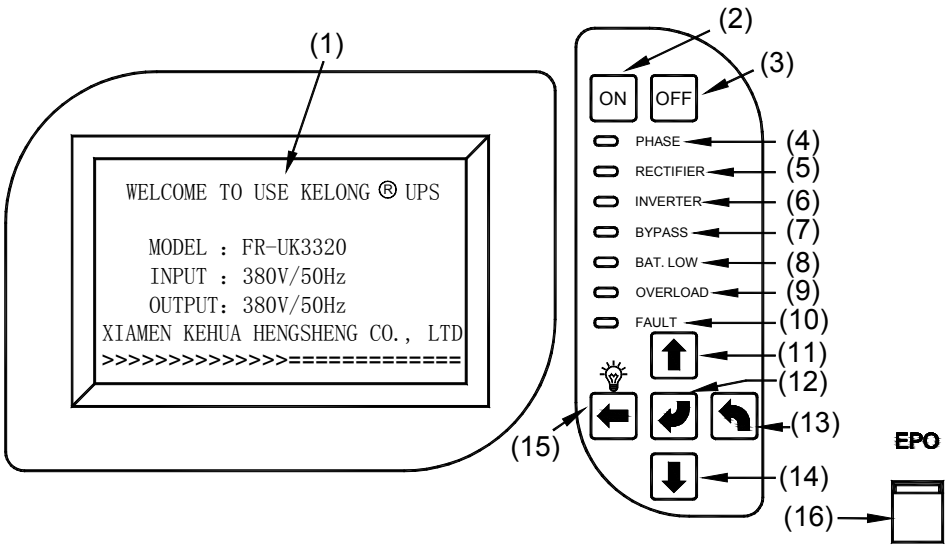


Fig. 1-F Display panel interface of three-phase（20~60 KVA）UPS

Explanation ：

(1)、LCD display：Show the running parameter and status of UPS（as voltage、current、load etc）.
(2)、on button
(3)、off button
(4)、Phase alarm light（red）：The light will be on when the phase of rectifier input or bypass input is error.
(5)、Work flow light of rectifier（green）：The light will be on when the rectifier is normal.
(6)、Work flow light of inverter（green）：The light will be on when the inverter is normal.
(7)、Bypass alarm light（red）：The light will be on when there is bypass output.
(8)、Battery low alarm light（red）：The light will be on when the battery is low.
(9)、Overload alarm light（red）：The light will be on when the output of UPS is overload.
(10)、Fault alarm light（red）：The light will be on when rectifier、inverter or bypass is error.
(11)、Page up button：Use when lookup display contents of LCD.
(12)、Enter button：Use when lookup display contents of LCD.
(13)、Backup button：Lookup display contents of LCD.
(14)、Page down button：Use when lookup display contents of LCD.
(15)、Page left button：Use when lookup display contents of LCD and turn on LCD screen light.
(16) EPO Emergency Power Off button: Under emergency situation, press EPO button, it will be shut down and without output.

1.7.2 Display Structure and Display Interface of Three-Phase（40~160 kVA）UPS

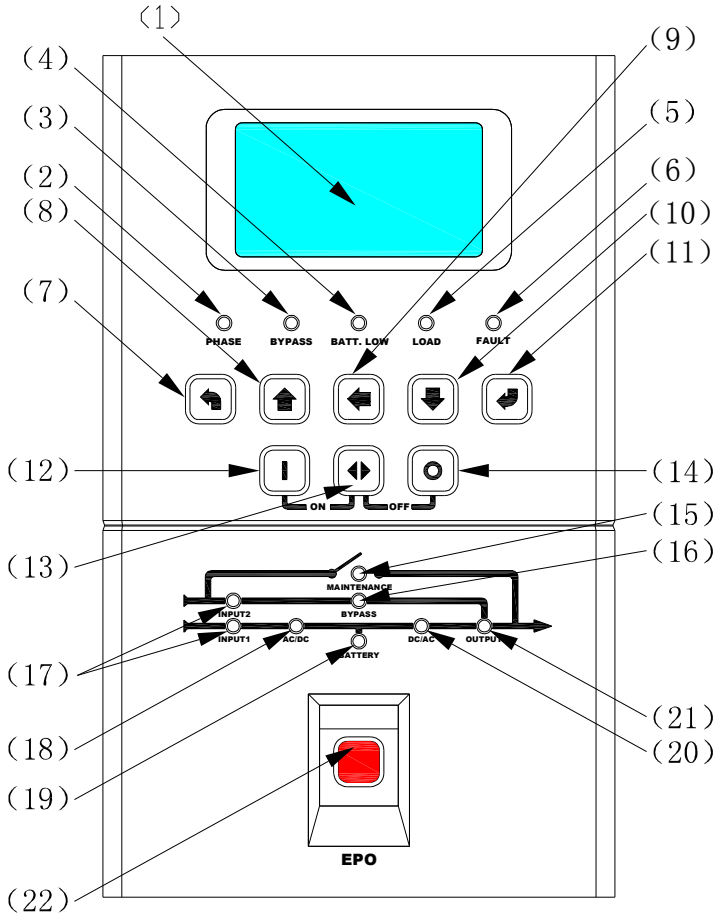


Fig. 1-G Display panel structure of three-phase（40~160 kVA）UPS

Explanation：

(1) LCD display：Show the running parameter and status of UPS（as voltage、current、load etc）.
(2) Phase alarm light（red）：The light will be on when the phase of rectifier input or bypass input is on error.
(3) Bypass alarm light（green）：The light will be on when it is on Bypass. For UPS it's red, for IPS it's green.
(4) Battery low alarm light（red）：The light will be on when the battery is low.
(5) Overload alarm light（red）：The light will be on when the output of UPS is on overload.
(6) Fault alarm light（red）：The light will be on when inverter is on error.
(7) Backup button：Used for lookup display contents of LCD.
(8) Page up button：Used for lookup display contents of LCD.
(9) Page down button：Used for lookup display contents of LCD.
(10) Page down button：Used for lookup display contents of LCD.
(11) Enter button：Used for lookup display contents of LCD.
(12) On button：Used with button 13 for start-up.

(13) Enter button：Used with button 12 for start-up; Used with button 14 for shutdown.
(14) OFF button：Used with button 13 for shutdown.
(15) Indication lamp of manual maintenance bypass workflow (green): Lights on when maintenance bypass power supply.
(16) Indication lamp of bypass workflow (green): Lights on when bypass power supply.
(17) Utility input indication lamp (green): Lights on when there is utility input.
(18) Rectifier workflow indication lamp (green): Lights on when rectifier is working normally.
(19) Battery workflow indication lamp (green): Lights on when battery power supply.
(20) Inverter workflow indication lamp (green): Lights on when inverter is working normally.
(21) Output flow indication lamp (green): Lights on when there is output voltage.
(22) EPO Emergency Power Off button: Under emergency situation, press EPO button, it will be shut down and without output.

1.7.3 Outlook of three-phase UPS FR-UK series（10~30 kVA）

Fig. 1-H Outlook of three-phase UPS FR-UK series（10~30 kVA）

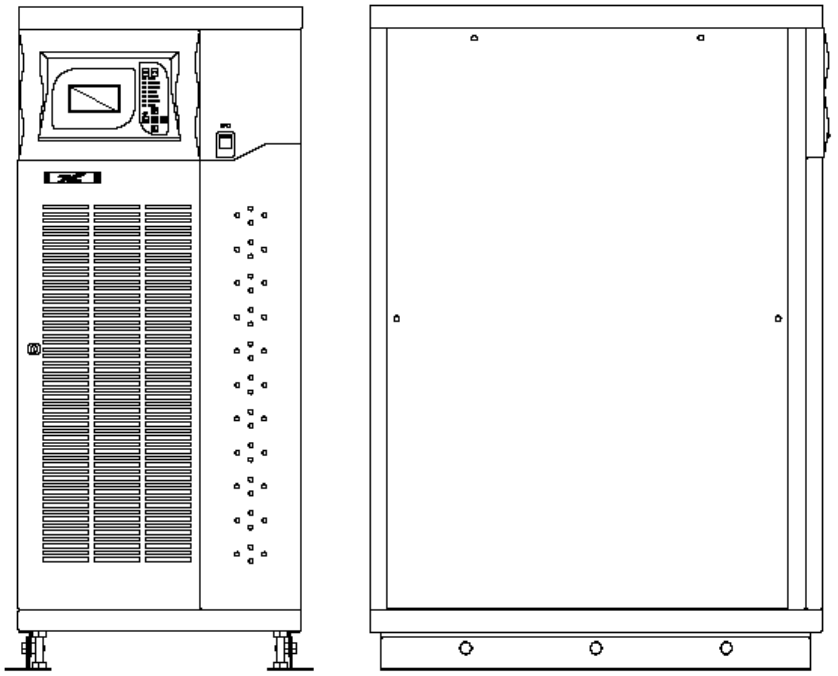


Fig. 1-I External view for FR-UK3310~FR-UK3330

1.7.4 Outlook of three-phase UPS FR-UK series（40~60 kVA）

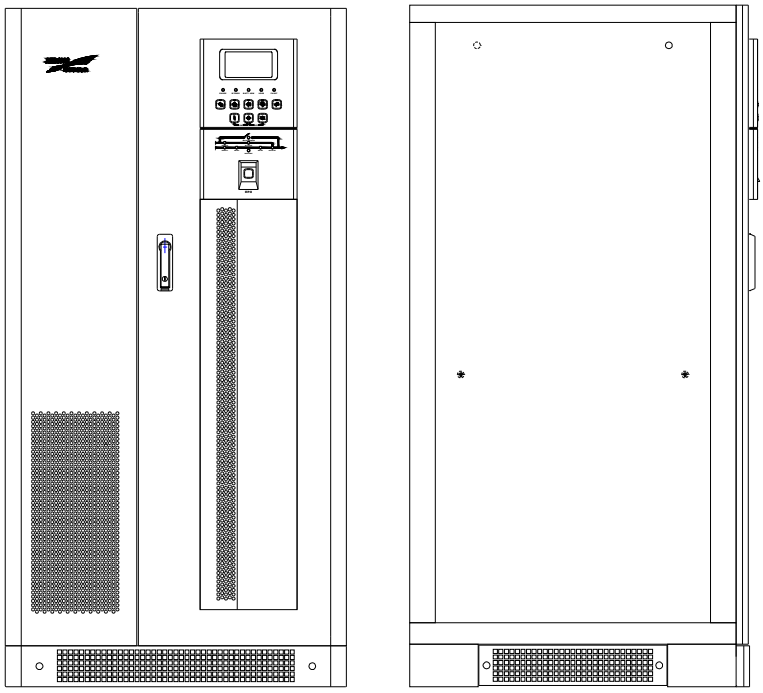


Fig. 1-J The front and rear panel of FR-UK3340~FR-UK3360

1.7.5 Outlook of three-phase UPS FR-UK series（80~160 kVA）

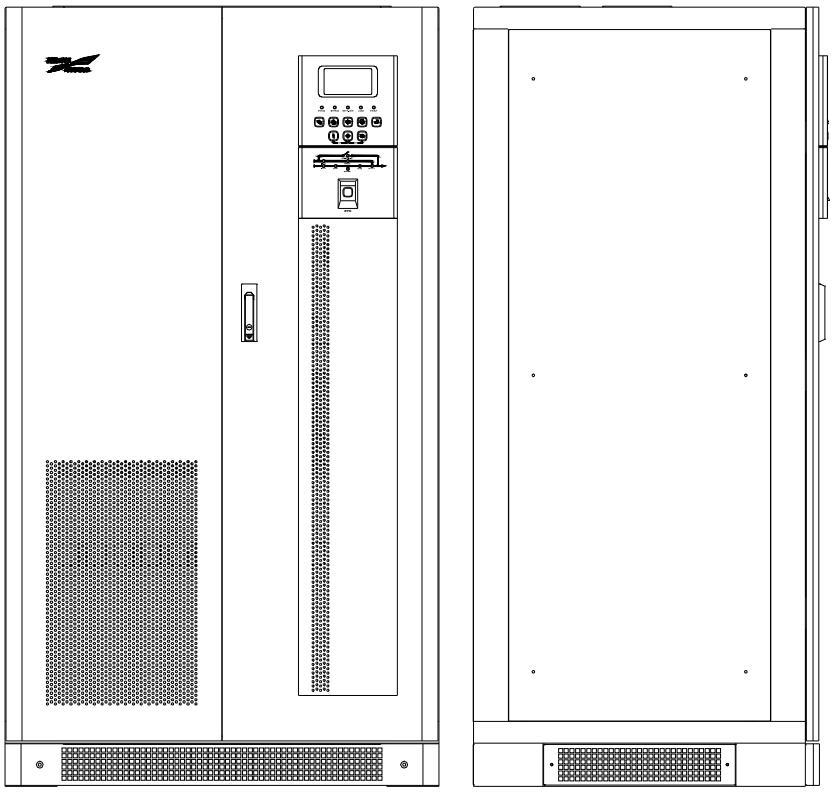


Fig. 1-K The front and rear panel of FR-UK3380~FR-UK33160

2. Physical Specification

Table 2-1 Physical Specification FR-UK series (10～30kVA)

Specification \ Model		FR-UK(/B) 3310	FR-UK(/B) 3315	FR-UK(/B) 3320	FR-UK(/B) 3325	FR-UK(/B) 3330
Input	Rectifier constitution	three-phase-control rectify				
	Voltage (Vac)	380±25%				
	Rectifier Frequency range (Hz)	40~65				
	SYNC Frequency Tracking range (Hz)	50±5%				
	Phase	3φ4W+GND				
	Battery voltage (VDC)	12V×29=348V				
	Charging Current (A)	Self-adjusting according to capacity of battery, the max. charging current is 40A				
output	Rated power (kVA)	10	15	20	25	30
	Phase	3φ4W+GND				
	Voltage (Vac)	L－N：220　L-L：380				
	Frequency (Hz)	normal Main power：synchronous tracking automatically; abnormal Main power：50±0.2%				
	Unbalance three-phase voltage stabilization with full load	≤2%，compatible 100％unbalance				
	Wave form	Sine wave, THD<3% at linear load				
	Switch time (ms)	0				
	Efficiency	⩾90%				
	Overload capacity	125% of rated load last for 10 minutes, 150% of rated load last for 1 second				
Others	Maintenance switch	Maintenance switch with no switch time				
	Start-up	Provided with DC start up function				
	LCD display	Input voltage/ Frequency, Output voltage, Battery voltage, Load, DC current etc.				
	LED display	Work status of UPS and fault indication				
	Alarm function	AC input abnormal, Low battery, Overload, Failure				
	Communication function	RS232/RS485, dry connection communication signal				
	Battery test function	Present（for details see battery test control in LCD display operation）				
	Protect function	Output short circuit, Overload, Over-temperature, Battery low voltage, Output over/low voltage				
	EMC	Meet GB/T 7260.3-2003				
	Noise（dB）	＜65				
	Cooling	Fans				

	Operating Temperature(□)	0～40				
	Relative Humidity	0～95%，No condensation				
	Dimension (W×D×H)(mm)	500×800×1180				
	Weight (kg)	185	195	205	220	235

◆ **Specifications are subject to change without prior notice.**

Table 2-2 Physical Specification FR-UK series (40～100kVA)

Specification \ Model		FR-UK(/B) 3340	FR-UK(/B) 3350	FR-UK(/B) 3360	FR-UK(/B) 3380	FR-UK(/B) 33100
Input	Rectifier constitution	three-phase-control rectify				
	Voltage (Vac)	380±25%				
	Rectifier Frequency range (Hz)	40~65				
	SYNC Frequency Tracking range (Hz)	50±5%				
	Phase	3φ4W+GND				
	Battery voltage (VDC)	12V×29=348V				
	Rectifier constitution	Self-adjusting according to capacity of battery, the max. charging current is 40A				
output	Rated power (KVA)	40	50	60	80	100
	Phase	3φ4W+GND				
	Voltage (Vac)	L—N：220 L-L：380				
	Frequency (Hz)	normal Main power：synchronous tracking automatically; abnormal Main power：50±0.2%				
	unbalance three-phase voltage stabilization with full load	≤2%，compatible 100%unbalance				
	Wave form	Sine wave, THD<3% at linear load				
	Switch time (ms)	0				
	efficiency	≥90%				
	Overload capacity	125% of rated load last for 10 minutes, 150% of rated load last for 1 second				
others	Maintenance switch	Maintenance switch with no switch time				
	Start-up	provided with DC start up function				
	LCD display	Input voltage/ Frequency, Output voltage, Battery voltage, Load, DC current etc.				
	LED display	Work status of UPS and fault indication				
	Alarm function	AC input abnormal, Low battery, Overload, Failure				
	Communication function	RS232/RS485, dry connection communication signal				
	Battery test function	Present（for details see battery test control in LCD display operation）				

	Protect function	Output short circuit, Overload, Over-temperature, battery low voltage, Output over/low voltage				
	EMC	Meet GB/T 7260.3-2003				
	Noise（dB）	＜65				
	Cooling	Fans				
	Operating Temperature (□)	0～40				
	Relative Humidity	0～95%，No condensation				
	Dimension (W×D×H)(mm)	800×800×1600			1000×800×1800	
	Weight (kg)	430	450	470	680	705

◆ **Specifications are subject to change without prior notice**

Table 2-3 Physical Specification FR-UK series (120～160kVA)

Specification \ Model		FR-UK(/B) 33120	FR-UK(/B) 33160
Input	Commutation	Three-phase commutation	
	Voltage (Vac)	380±25%	
	Rectifier Frequency range (Hz)	40~65	
	SYNC Frequency Tracking range (Hz)	50±5%	
	Phase	3φ4W+GND	
	Battery voltage (VDC)	12V×29=348V	
	Charging current (A)	Self-adjusting according to capacity of battery, the max. charging current is 40A	
output	Rated power (KVA)	120	160
	Phase	3φ4W+GND	
	Voltage (Vac)	L－N：220 L-L：380	
	Frequency (Hz)	normal Main power：synchronous tracking automatically ； abnormal Main power：50±0.2%	
	unbalance three-phase voltage stabilization with full load	≤2%，compatible 100%unbalance	
	Parallel form	Under linear load: THD＜3%	
	Unbalance degree of load current in parallel	0	
	Wave distortion	≥90%	
	Switch time (ms)	125% of rated load last for 10 minutes, 150% of rated load last for 1 second	
Others	Maintenance switch	Maintenance switch with no switch time	
	Start-up	provided with DC start up function	

	LCD display	Input voltage/ Frequency, Output voltage, Battery voltage, Load, DC current etc.	
	LED display	UPS‘ s operation activity status	
	Alarm function	Overload, AC input abnormal, Low battery, Failure	
	Communication function	RS232/RS485, dry connection communication signal	
	Battery test function	Present（for details see battery test control in LCD display operation）	
	Protect function	battery low voltage, Overload, Over-temperature, Output short circuit, Output over/low voltage	
	EMC	Meet GB/T 7260.3-2003	
	Noise（dB）	＜65	
	Cooling	Fans	
	Operating Temperature（□）	0～40	
	Environment Humidity	0～95%，No condensation	
	Dimension (W×D×H)(mm)	1000×800×1800	
	Weight (kg)	745	805

◆ **Specifications are subject to change without prior notice.**

3. Installation for UPS

3.1 Installation instruction

1. Please check if the grid connections, including various contacts and socket are in good condition, to avoid open circuit or short circuit.
2. For the single-phase three-wires input UPS, the grounding connection must be good, and the voltage between neutral wire of utility and ground wire in machinery room should be under 5V; if the AC input ground wire is floating, the voltage between input neutral wire and ground wire may reach 100V; If the user has strict requirement for the voltage between neutral wire and ground wire, please note that AC input ground should be good to avoid unnecessary losses.
3. When installing the UPS, do not reverse connecting the input and output neutral wire, live wire and ground wire of UPS or wrong connecting, so as not to cause electrical short circuit; also should check if the input mains voltage is normal.
4. When install the long backup time battery pack, be sure to connect them according to the battery installation instructions, and connection wiring must be locked, the battery's positive and negative short-circuit are prohibited, any contact with the battery connection wire terminal or bare wire terminals is prohibited, or may result in battery damage or personal injury. When connect the battery pack with UPS, check battery voltage is consistent with the provisions of UPS.
5. UPS Installation Requirements:
   - ◆Please put UPS on the flat ground (to avoid tilt, uneven ground)
   - ◆Do not place objects on top of the UPS, personnel should not sit on top of UPS.
   - ◆Avoid placing UPS in sunlight, rain or wet places.
   - ◆Do not place the UPS in the place with corrosive gas.

3.2 Installation Steps

Three phase UPS FR-UK series（10~160 kVA）installation flow chart as Fig 3-1shown.

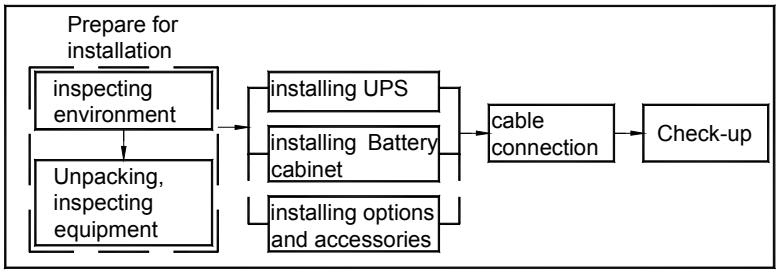


Fig 3-1System installation flow chart

Instruction：

To install and set the UPS by the manufacturer or manufacturer authorized personnel.

3.3 Preparing for Installation

3.3.1 Check the installation site

Caution：：

Beforeg in s installing the UPS, on-site environment should be meet the basic conditions of equipment operatin afety and good condition. If the on-site environment does not meet the basic criteria, please transform the scene accordingly. Only meet the basic condition, the UPS could be installed.

3.3.1.1 The basic requirements of the environment

Ambient temperature：0℃～+40℃；
Relative Humidity：0%RH～95%RH，No condensation；
Cooling: Air Cooled;
Altitude：Consistent with GB / T 7260.3-2003 requirements;
Vertical：No vibration and no more than the vertical gradient 5º；
Pollution Level：Class Ⅱ 。
UPS should be installed with sufficient ventilation, cooling, humidity not high and dust-free environment. Recommended operating temperature is 20 ~ 25 ℃, humidity at 50%

Caution：：

Install the UPS in a metal conductive dust working environment is prohibited.

3.3.1.2 The basic requirements for power supply

1. Grounding preparation. Ground terminal is ready, voltage between the neutral wire and ground wire should not exceed 5 V.
2. AC input voltage and load capacity of main input line
   Before UPS be installed, make sure that the AC input voltage and load capacity of main input lines are meet the equipment requirements, and consider whether the carrying capacity will decline caused by wire aging.
   Three-phase UPS FR-UK series (10 ~ 160kVA) require AC input voltage range of 380 ± 25% (Vac). The UPS system capacity should be greater than the maximum input power.

3. Configuration of the AC input breaker protection
   Configure with a UPS capacity compatible breaker or distribution box before the installation of UPS cable, so as to separate with UPS and main. Taking into account the impact of instantaneous power current, the breaker should be 1.5 to 2 times current of the UPS input maximum current, and the breaker with the air leakage protection is not allowed to prevent breaker malfunction. Breaker selection please refer to Table 3.3 -1:

Table 3.3-1 Input\Output breaker capability:

Power (kVA)	Input	Max. current (A)	Breaker capability (A)
10	220/380V 3Φ	24	32
15	220/380V 3Φ	35	50
20	220/380V 3Φ	47	50
25	220/380V 3Φ	59	63
30	220/380V 3Φ	70.5	100
40	220/380V 3Φ	94	100
50	220/380V 3Φ	117.5	125
60	220/380V 3Φ	141	160
80	220/380V 3Φ	188	200
100	220/380V 3Φ	235	250
120	220/380V 3Φ	281.8	300
160	220/380V 3Φ	375.8	400

Table 3.3-2 input/output breaker capability

Power（kVA）	Output	Max. current (A)	Breaker capability (A)
10	220/380V 3Φ	16	32
15	220/380V 3Φ	23	32
20	220/380V 3Φ	30	50
25	220/380V 3Φ	38	63
30	220/380V 3Φ	45.5	63
40	220/380V 3Φ	60	100
50	220/380V 3Φ	75.8	100
60	220/380V 3Φ	91	125
80	220/380V 3Φ	121	160
100	220/380V 3Φ	151.5	200
120	220/380V 3Φ	182	250
160	220/380V 3Φ	242	300

4. Input and output cable selection

UPS AC input, output cable, battery cable wire cross-sectional area of the selection , please refer to table 3.3-3.

Table 3.3-3 Cable specification for input/output

Input：

Power(kVA)	Input	Current（A）	Live wire Section acreage (mm^2)	Neutral wire Section acreage (mm^2)	Ground wire Section acreage (mm^2)
10	220/380V 3Φ	23	6	6	4
15	220/380V 3Φ	35	10	10	10
20	220/380V 3Φ	46.5	10	10	10
25	220/380V 3Φ	59	16	16	10
30	220/380V 3Φ	70.5	16	16	10
40	220/380V 3Φ	93	25	25	10
50	220/380V 3Φ	117.5	25	25	10
60	220/380V 3Φ	141	35	35	16
80	220/380V 3Φ	144	50	50	25
100	220/380V 3Φ	180	70	70	35
120	220/380V 3Φ	210	95	95	35
160	220/380V 3Φ	288	50×2	50×2	50

Output：

Cable

Power (kVA)	Output	Current （A）	Live wire Section acreage (mm^2)	Neutral wire Section acreage (mm2)	Ground wire Section acreage (mm2)
10	220/380V 3Φ	15	6	6	4
15	220/380V 3Φ	23	10	10	10
20	220/380V 3Φ	29	10	10	10
25	220/380V 3Φ	36	16	16	10
30	220/380V 3Φ	46	16	16	10
40	220/380V 3Φ	58	16	16	10
50	220/380V 3Φ	72	25	25	10
60	220/380V 3Φ	92	25	35	10
80	220/380V 3Φ	121	35	35	16
100	220/380V 3Φ	151	50	50	25
120	220/380V 3Φ	182	70	70	35
160	220/380V 3Φ	243	95	95	50

connected to battery (BAT. Voltage range：300-410 VDC)：

Power (kVA)	Max. Current（A）	Section acreage of wire (mm2)
10	26	6
15	38	10
20	51	16
25	64	20
30	77	25
40	102	25
50	128	35
60	153	35
80	240	70

100	310	95
120	360	95
160	480	50×2

Above sectional area of the cable connection is just for about 5 meters cable reference, if the length is more than 20 meters, the wire cross-sectional area has to be increased correspondingly.

5. Lightning facility

   Frequent lightning area, the main input should be equipped with multi-degree lightning protection systems to ensure safe operation of equipment. Outdoor installation should increase the level of the lightning of AC input power.

3.3.2 Unpacking and Inspection

3.3.2.1 Transportation

1. Arrange the appropriate means of transport and lifting (eg forklifts) according to the product packing dimension.
2. Due to the product's size are large, please unpack at the chosen location. The installation site should be near to the unpacking locations as near as possible.
3. Please pay attention to the turning corner, the slope of uphill and downhill during transportation process to prevent the equipment from the collision.

3.3.2.2 Unpacking

1. When installing, please move the equipment to the installation site, then unpacking it.
2. After unpacking, please check the system components are correct and complete according to the packing list.

Tips：

For your convenience in case of the transport and packaging in the future, please put the packaging material in the box and preserve them properly. Note: If you find the components does not match with the packing list of the contract, please record them timely, and contact with Kehua local Branch or office or distributor immediately

3. After unpacking, check whether the equipment has mechanical damage caused by transportation.

Tips：

If you find the UPS has serious damage in appearance, please check further, please record them timely, and contact with Kehua local Branch or office or distributor immediately.

3.4 Equipment Installation

3.4.1 Installation Notes

1. Do not place in areas with corrosive gases. Ensure that the equipment be placed in well-ventilated location, to facilitate heat dissipation
2. The UPS should be placed in a horizontal place, avoid placing in the rugged, sloping areas. Do not put objects on top of the cabinet.
3. Switch the breaker “OFF” before Wiring. Do not reversely connect the ground with the neutral line, live line with the neutral line, in case of causing electrical short circuit. Note it should be well grounded, neutral line and ground line voltage should be no higher than 5 V. If the UPS system output are through the transfer appliances, please check the quality of the transfer electrical appliances so as not to cause open or short circuit.

3.5 Check the main input

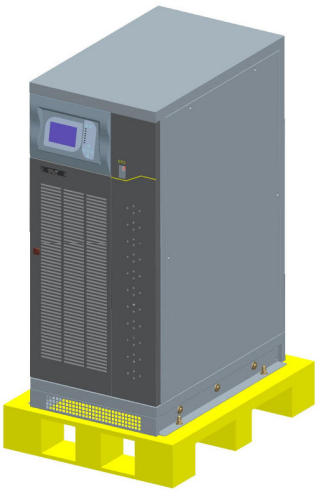
Please re-confirm if the network load capacity are able to meet the requirements of UPS, whether mains power supply are complied with UPS nameplate’s voltage and frequency, whether the aging of the wire caused carrying capacity decline. If any question, please contact the local main supplier.

3.6 Installation of UPS

3.6.1 Installation steps of three-phase UPS FR-UK Series (10～30 kVA)

Remove the UPS from pallets to ground for installation. Below is the installation introduction for the three-phase UPS FR-UK Series（10～30 kVA）

1. The external structure of three-phase UPS FR-UK series (10～30 kVA) is as followed after



unpacking：

Fig. 3-2 10～30kVA UPS Installation steps 1

2. Select and plan installation site, drive 4 pieces of M10 expansion bolts into the ground. Required distance：506mm×525mm，the height of exposed expansion bolts should be constricted to within 50mm, details as shown below：

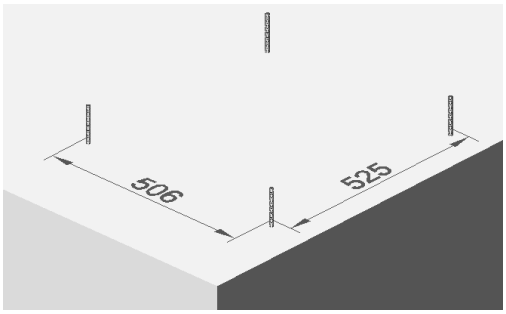


Fig. 3-3 10～30kVA UPS Installation steps 2

3. Take down the bolts which connect UPS and pallets and remove main unit from pallet to ground which already has anchored by M10 expansion bolts, locking bolts, as below:

Fig. 3-4 10～30 kVA UPS Installation steps 3

4. Connect UPS Input & Output cable According to “3.9 Electrical connection” ;

5. Installing the bolt and seal plate of base into the foundation of mian unit, as shown below:

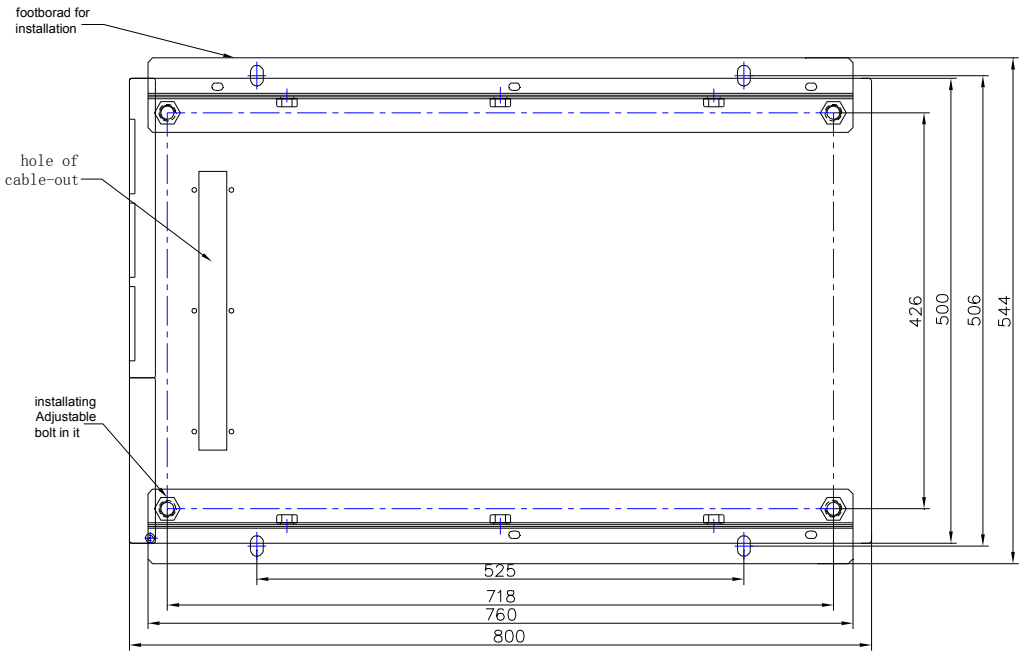


Fig. 3-5 10～30 kVA UPS Installation steps 5

3.6.2 Installation steps of three-phase UPS FR-UK Series (40～160 kVA)

Remove the mian unit of UPS from brackets to ground for installation. The installation steps of three-phase UPS FR-UK series (40~160kVA) are identical. Below take the installation of FR-UK series (80~160kVA) as examples to explain:

1. The external structure of three-phase UPS FR-UK series (80～160 kVA) is as followed after unpacking:

Fig. 3-6 80～160 kVA UPS Installation steps 1

2. Choose and layout installation site, drive 8 M10 expansion bolt into ground. Required distance as shown below，the exposed height of expansion bolt should be controlled within 50mm. Details as below：

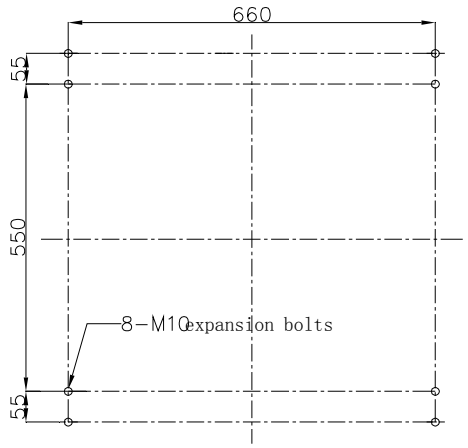


Fig. 3-7 40～60 kVA UPS Installation steps 2- size chart for Expansion bolt

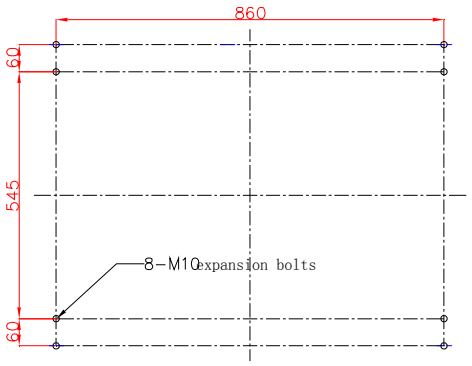


Fig. 3-8 80～160 kVA UPS Installation steps 2- size chart for Expansion bolt

3. Take down bolt that connect mian unit and bracket，remove mian unit from bracket to ground which have anchored by expansion bolt，locking bolts, as shown below:

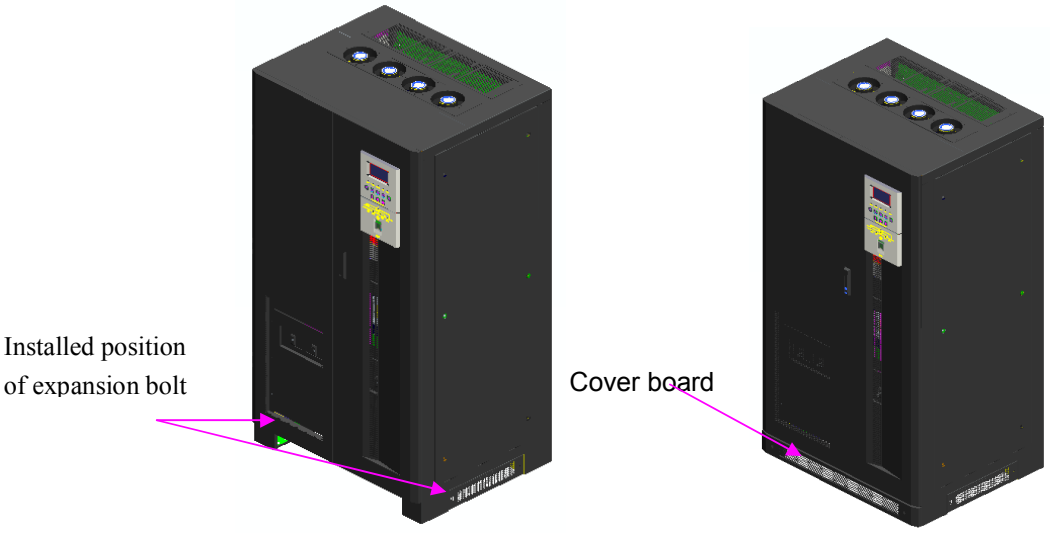


Fig. 3-9 80～160 kVA UPS Installation steps 3

4. Connect Input & Output wire of UPSS based on “3.9 Electricity connection”.
5. Installing the bolt and seal plate of base to the foundation of main unit, as shown above.

3.6.3 The structure of base plate of three-phase UPS FR-UK Series (10~160 kVA)

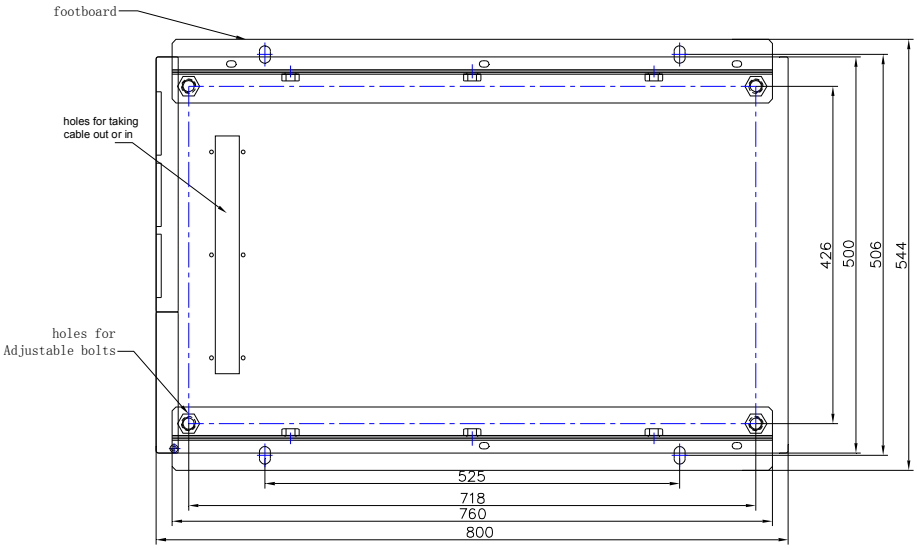


Fig. 3-A the structure of base plate of three-phase UPS FR-UK Series (10~30 kVA)

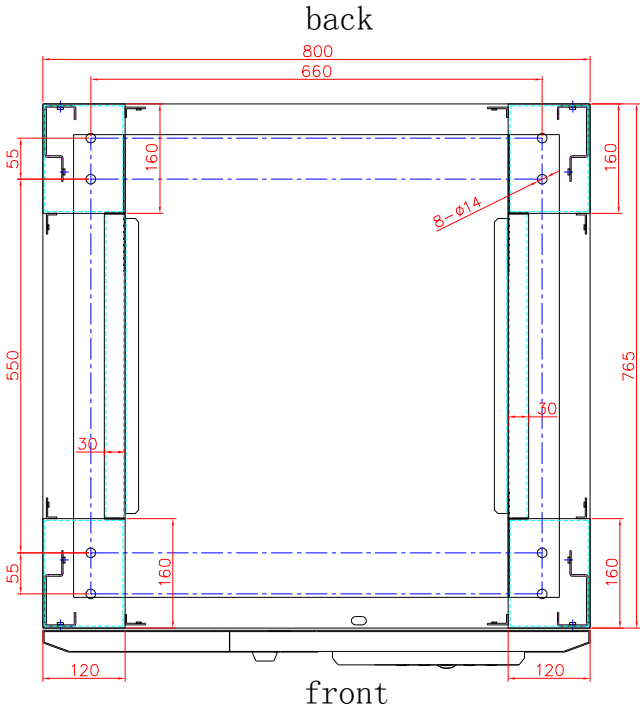


Fig.3-B the structure of base plate of three-phase UPS FR-UK series (40~60 kVA)

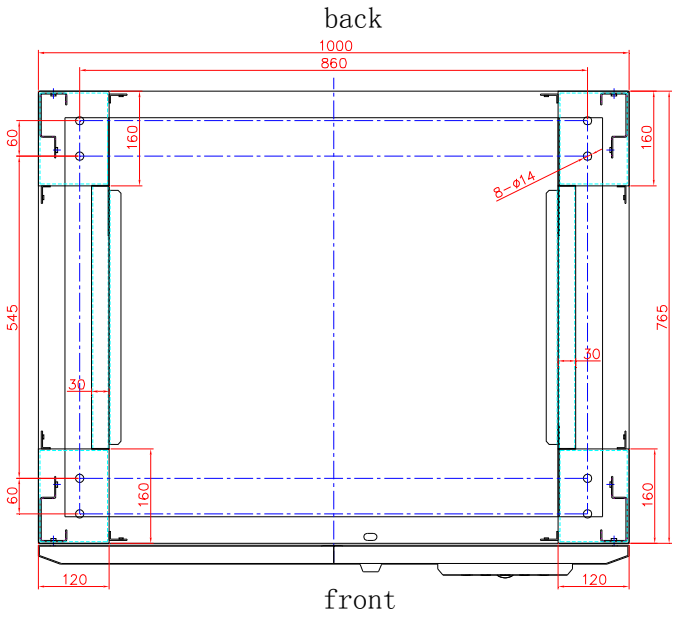


Fig. 3-C the structure of base plate of three-phase UPS FR-UK series (80~160 kVA)

3.7 Battery Cabinet Installation

Caution：：

UPS & Battery Cabinet should be purchased separately.

3.7.1 Important safety rules

Forced open or disassemble a battery is prohibited. Because of the internal electrolyte is harmful to skin and eyes. When you replace the battery in order to avoid the risk of electric shock and short circuit , please pay special attention to the following preventive measures:

1. Do not wear watches, rings or other metal jewelry;
2. Use tools with insulated handle;
3. Do not put tools or metal objects on top of the battery;
4. Do not let the fire near to the battery; no smoking.

3.7.2 Installation step

1. To ensure safe operation and avoid unnecessary damage to the equipment, the assembly work of UPS with external battery has to be done by the personnel with technical expertise according to following program operation:
   1) Connect the external battery pack cable, but do not connect with UPS external battery input terminal;
   2) Connect the input power line with UPS, but make sure that the correctness of polarity and voltage specifications meet the requirements of UPS.

2. When the AC input is normal and UPS without any load, turn on the UPS breaker and measure input DC voltage.
3. After the charging voltage is normal in Step "2", turn off the UPS. And connect UPS with the battery pack, check if the polarity of UPS and battery pack are correct.
4. After assembly, the UPS can be used after testing done

3.8 (Parallel) System installation

Install the system according to previous described methods, install the battery pack and UPS host of the parallel system respectively; connect the AC output of the parallel unit to the distribution box of parallel system.

Caution：

The AC input connection, phase sequence of the parallel system units should be strictly consistent, to ensure that bypass parallel system have the same power phase.

Connect the parallel port of each unit by the shielded communication line, and fasten the corresponding RS232 fastening screws.

3.9 Electrical connection

3.9.1 Wire modes of single UPS

Connect cable accompanied with UPS to relative terminal and ensure reliable connection.

Caution 1：

When wiring, make sure there should be linked firmly between input & output wires and input & output terminal. Not allow to loose contact or connect inversely!

Caution2：

When applying single machine, no further wiring is needed for bypass live sire and bypass Null wire.

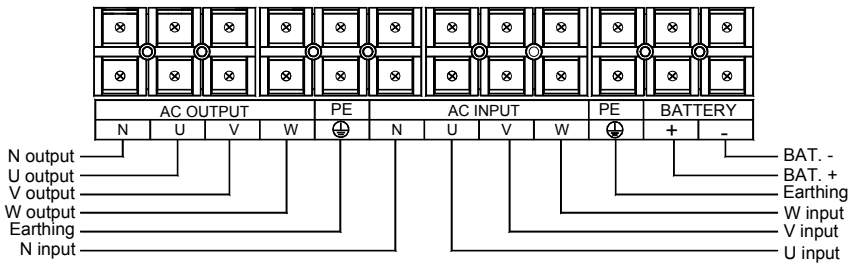


Fig. 3-D Terminal wiring chart of Three-phase UPS FR-UK series (10~30 kVA)

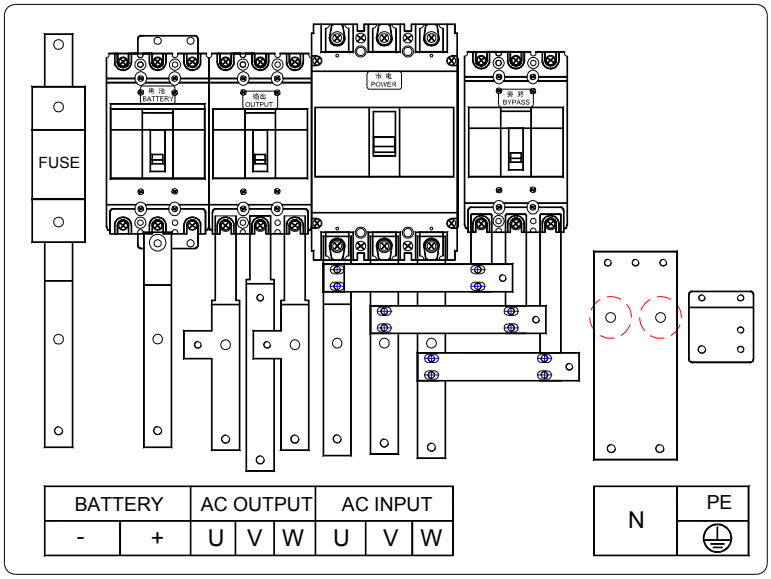


Fig. 3-E Terminal wiring chart of Three-phase UPS FR-UK series (40~60 kVA)

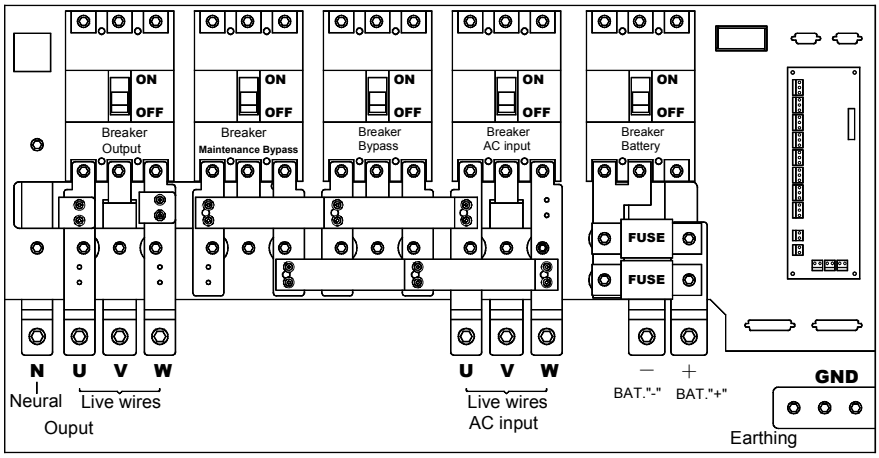


Fig. 3-F Terminal wiring chart Three-phase UPS FR-UK series (80~160 kVA)

Caution：

Three phase live wire using U、V、W as identification methods, corresponding to A phase, B phase, C phase, or the R phase, S phase, T phase.

3.9.2 Method of Connection for the two units of UPS by Hot Standby System.

3.9.2.1 Connection steps

1. Dismantle the breaker cover board in the front of the UPS (connection bar), visible the breaker and connection terminal.
2. Connect output three-phase live wires of slave unit to the bypass input breaker in order, the output neural of slave unit to the input neutral of main unit, see below detail specification.

Caution:

Utility input phase order should be right, or machine cannot start normally and the wrong phase order connection should be corrected. Phase order indicator on panel will light on.

3. Connect the utility input of main unit to the utility input of slave unit.
4. Other connection is the same as the connection of single unit.
5. Check all connection, make sure the connection is right, re-install and tighten the breaker cover board of both main and slave unit.

3.9.2.2 Connecting way

1. Connecting ways of Three- phase FR-UK series (1~30 kVA) Serial Hot Standby System

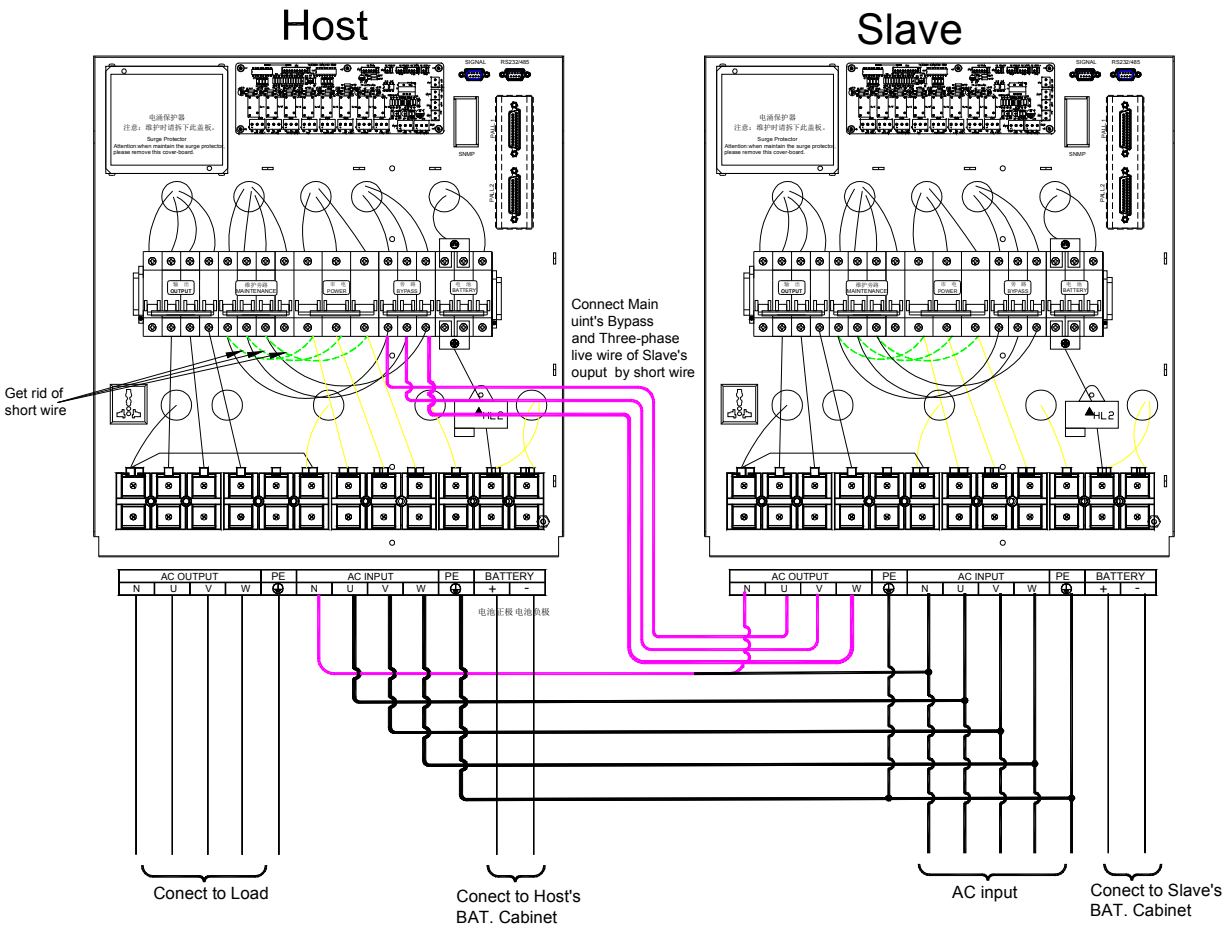


Fig. 3-G Connecting ways of Three- phase FR-UK series (1~30KVA) Serial Hot Standby System

Connection Description:

Dismantle the short wire connecting between bypass input breaker and utility input breaker of main unit, and dismantle neutral of input. Connect the Three-phase live wires of standby unit to the bypass input breaker in order; the output neutral of standby unit to input neutral of main unit.

2. Connecting ways of Three- phase FR-UK series (40~60 kVA) Serial Hot Standby System

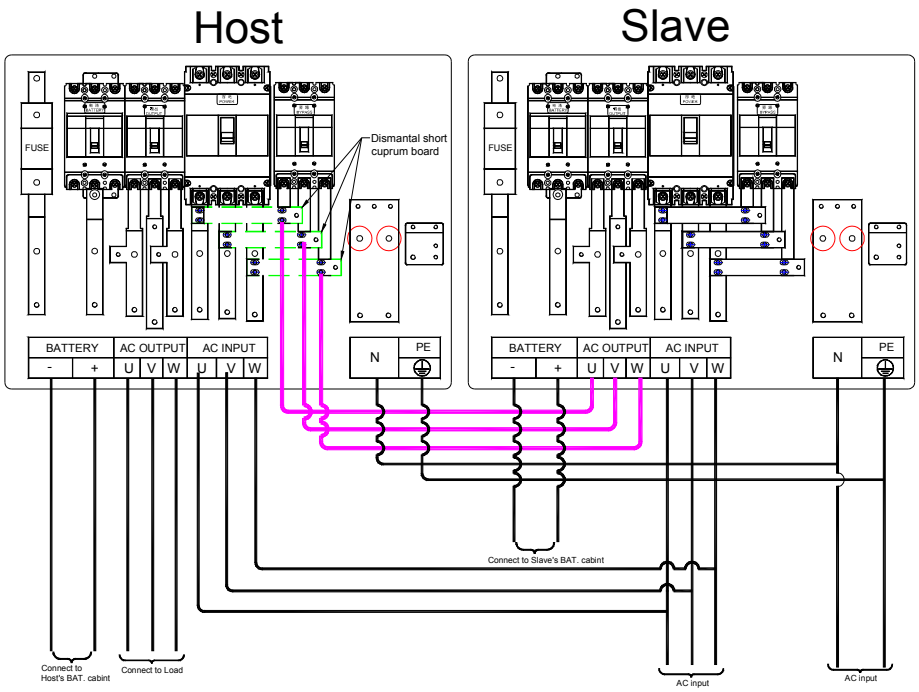


Fig. 3-H Connecting ways of Three- phase FR-UK series (40~60 kVA) Serial Hot Standby System

Connection Description:

Dismantle the short cuprum board connecting between bypass input breaker and utility input breaker of main unit, and dismantle neutral of input. Connect the Three-phase live wires of standby unit to the bypass input breaker in order; the output neutral of standby unit to input neutral of main unit.

3. Connecting ways of Three- phase FR-UK series (80~160 kVA) Serial Hot Standby System

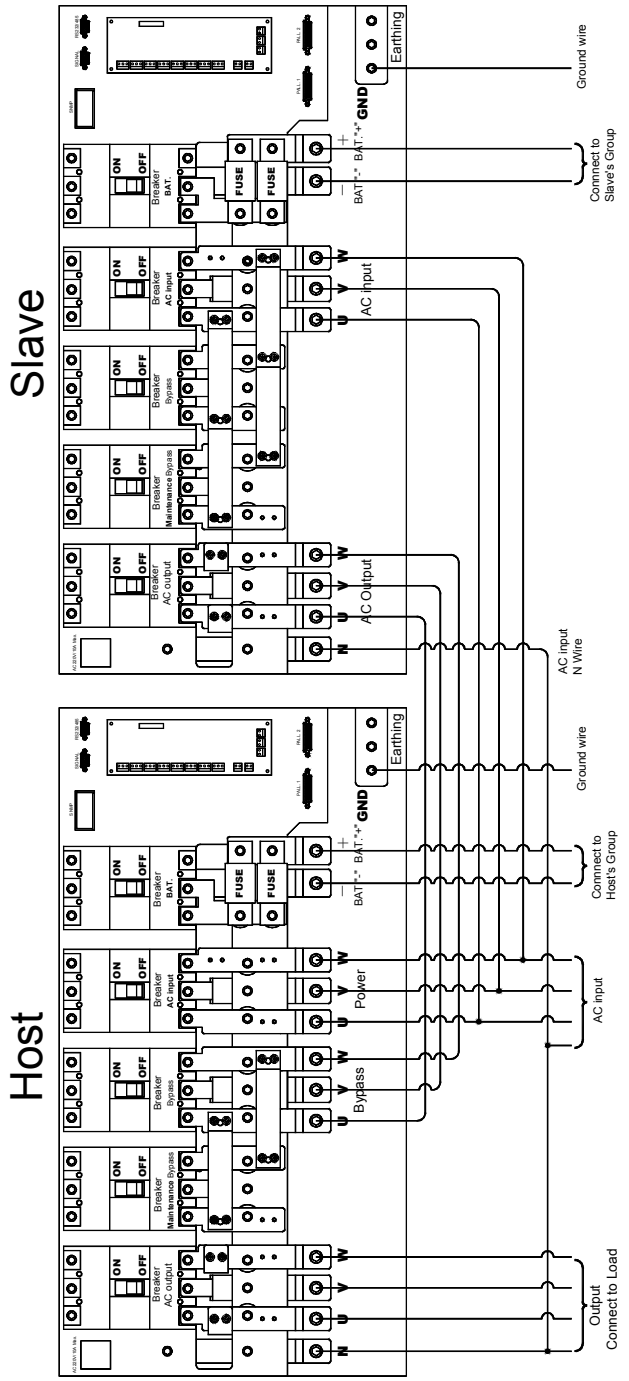


Fig. 3-I Connecting ways of Three- phase FR-UK series (80~160 kVA) Serial Hot Standby System

Connection introduction:

Three-phase live wire of main unit connect to bypass breaker of main unit in order:output netual wire of salve unit connect to input netual wire of main unit.

If user need change the machine to Serial Hot Standby System, then it should be informed to the UPS manufacturers in advance, so the manufactures can apply to provide the required copper bar request for changing the main unit. Main unit change as follows: Dismantle maintenance bypass breaker of main uint, short wire connecting copper bar of the bypass breaker and utility, dismantle

three bypass breaker connecting piece of main unit, install copper bar offered by UPS manufacture in three input terminal of bypass breaker, then short connect live wire of maintenance bypass breaker to bypass breaker in order, see the figure below.

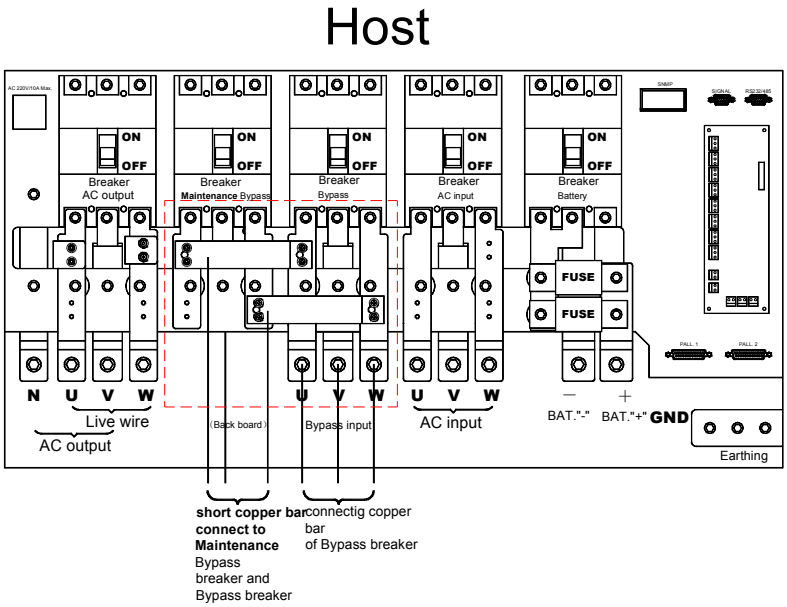


Fig. 3-J Charging copper bar for al Hot Standby System

Caution:

Three-phase live wire as U, V, W shown in figure above, are corresponding to A phase,B phase, C phase, or R phase, S phase, T phase.

3.9.3 Connecting way of Parallel System

3.9.3.1 Connection steps

1、Uncover UPS breaker cover board of front panel, find the breaker and connection terminal.

2、Connect the wires of input, output and battery: pay attention on the battery polarity must be connected correctly.

3、Output “N、U、V、W” of the UPS1, UPS2 should pigtail from the terminal of UPS1、UPS2 the user’s distribution cabinet, and short connect on distribution cabinet; UPS has output breaker, so the user no need to set breaker on the distribution for output circuit of each UPS, but there should be a main breaker at the output after two units of UPS installed in parallel.

4、Connect the parallel cables according to the following figure.

Caution:：

A. If utility supply input phase sequence connects wrongly, the machine should not start up normally, and the PHASE director will lights on. Adjusting the input phase sequence if it connects wrongly.

B. Make sure the input and output phase sequence of two units connects correctly before connect the two UPS to utility, please use multimeter to test Input Voltage phase A, B phase voltage, C phase voltage of two UPS, and they should be less than 5V.

5. Using shielded communication cable connecting all parallel systems and ports, also fastening the corresponded RS232 screws.

3.9.3.2 Connecting way

1. Three-phase (10~30 kVA) series UPS Parallel System connection is shown as following:

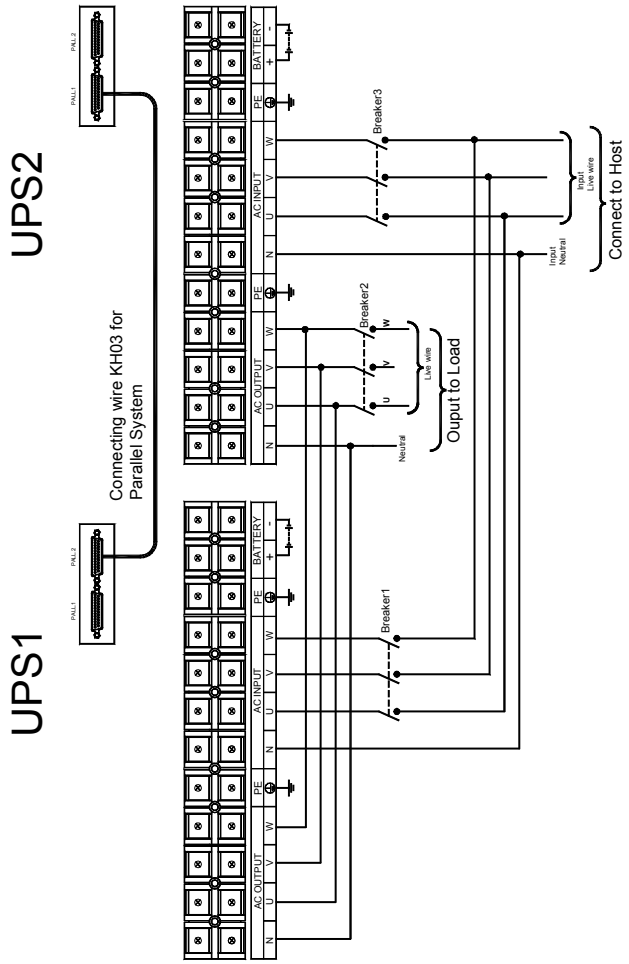


Fig. 3-k Three-phase (10~30KVA) series UPS Parallel System connection

2. Three-phase (40~60KVA) series UPS Parallel System connection is shown as following:

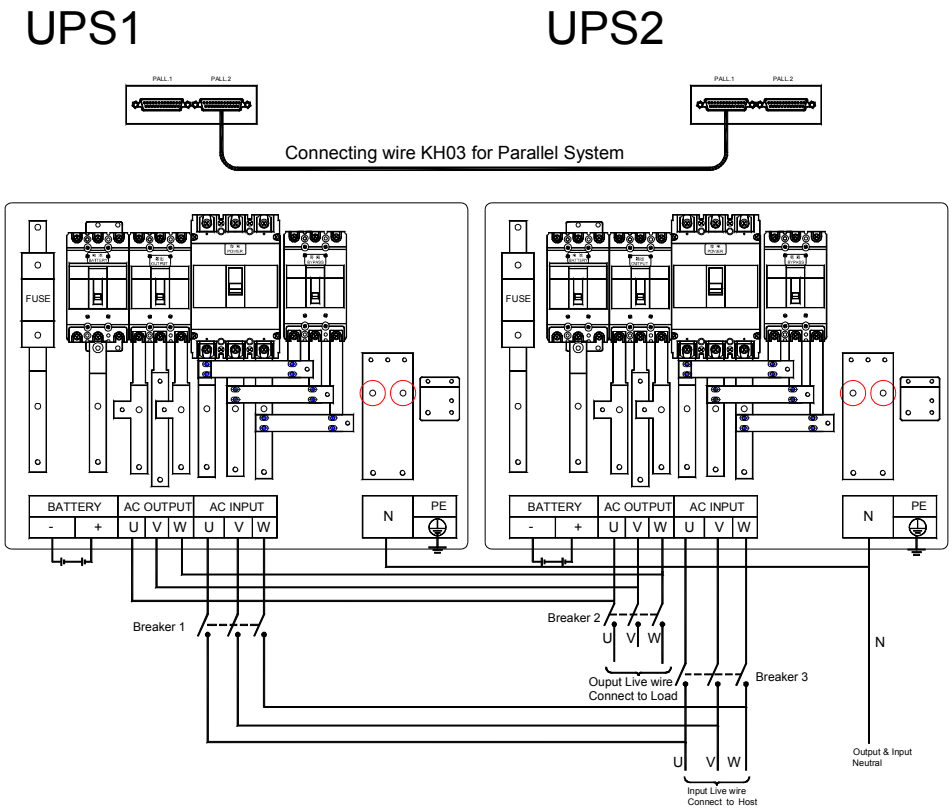


Fig. 3-L Three-phase (40~60KVA) series UPS Parallel System connection

3. Three-phase (80~160KVA) series UPS Parallel System connection is shown as following:

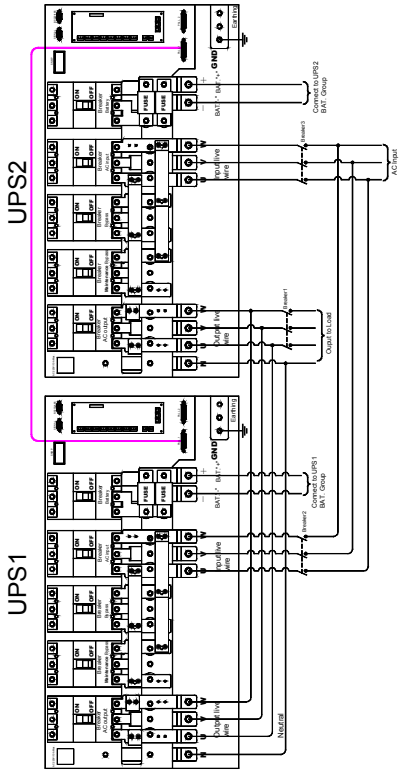


Fig. 3-M Three-phase (80~160 kVA) series UPS Parallel System connection

3.10 System Inspection and testing

3.10.1 Check electrical connections

After completion of electrical connections, please check electrical connections required per items listed in Table 4.10-1

Table 3.10-1 Check the list of electrical connections

No	Items to be checked	Result
1	Check if the color AC line cable is compliant with regulation	Y□ N□
2	Check if there is any loose wiring in the cabinet	Y□ N□
3	Check if the security labels of the AC power distribution units are complete	Y□ N□
4	Check if the cable connections are secure	Y□ N□
5	Check if the battery cable's polarity and sequence are correct	Y□ N□
6	Check if the cable is correctly identified	Y□ N□
7	Check if the cabling is neat, whether the cable lashing is compliant with process specification	Y□ N□
8	Check if the installation and wiring is conducive to the system's transformation, expansion, maintenance in the future.	Y□ N□

3.10.2 UPS testing

Testing UPS：It can simulate the main power failure situation by disconnect bypass input breaker or the main input breaker. When the main are off power, the main "LINE" LED will go out, and the buzzer will sound once every 5 seconds.

3.10.3 Connect with the load

Only after UPS starts and enters into the stable work, then open the load device; first start high-power devices, then start small power equipment. Some devices has large starting current which may cause overload protection (or bypass operation), it is better to start such equipment before the other devices.

4. Operation

4.1 Notes of using UPS

1. Please check if the load is appropriate before turn on the UPS. The load shall not exceed the rated output power UPS systems, to avoid of UPS overload protection.
2. Do not use the breaker of UPS as the load breaker, to avoid of the frequent start of the UPS
3. Only after UPS starts and enters into the stable work, then open the load device; Some device has large starting current which may cause overload protection, it is better to start such equipment before the other devices. first start high-power devices, then start small power equipment. If close the UPS, please be sure to close the load device before close the UPS.
4. When the main is cut off, if the UPS's power supply is from the generator, please start the generator first. After the generator is stable, then it can connect with UPS, or it may cause UPS or load damaged. Please turn off the main input breaker before close the generator.

4.2 UPS single unit operation process

Operation process as Fig.

Fig. **4-1**. It needs inspection before power on when start the UPS

first time, refer to Section 4.3.1. When the inspection is approved, the UPS can be turned on.

If UPS would not be used for long-term, it is also needed to inspect before power on when

restart using.

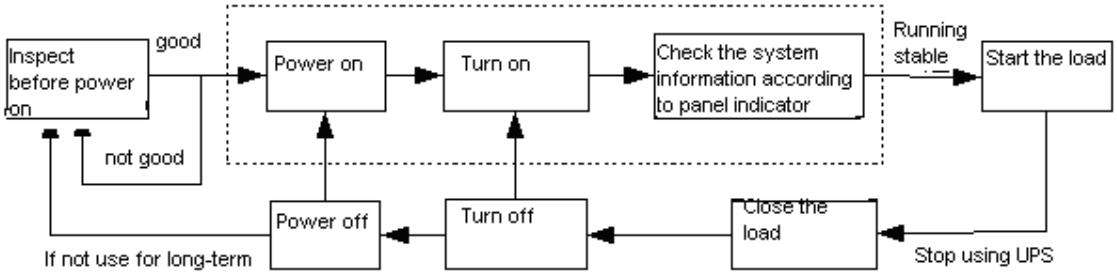


Fig. 4-1 single unit operation process

4.3 Operation instruction

4.3.1 Inspection before power on

Before power on the UPS, please inspect according to follow requirements for testing.
The UPS can be started only after the inspection is passed.

1. Confirm the main breaker (POWER), the battery breaker (BATTERY), and power breaker have been placed on the "OFF" state.
2. Inspect the load
   (1) Confirm the load is non-inductive load. UPS is not recommended to connect with the inductive load, such as motors, fans, air conditioners and other loads, such loads use the grid power directly.
   (2) Make sure that the load is turned off. Meanwhile, the load capacity shall not exceed the UPS rated output capacity, otherwise it will cause the system overload protection. Calculation of load capacity as follow:

FR-UK series UPS load capacity are designed according to 80% (nominal rated power) of the resistive load, in general FR-UK with computer load can withstand the maximum load number n estimated as following:

$$\sum_{i=1}^{n} pi \le p$$

P is UPS output capacity（VA），Pi is the No. 1 load VA

❋For example：One user has the following nominal power of the computer equipment

IBM PC：220V/1.5A (330VA)

LQ1600K printer：220V/1.0A (220VA)

14" color display monitor：70W

Total capacity＝330(VA)＋220(VA)＋70/0.6(VA)＝667(VA)。

Select 5KVA Nominal capacity UPS, it can withstand 7 to 8 sets of above equipments.

3. Confirm the UPS has no short circuit between the input live line and neutral line , no short circuit between the live line and the ground line. Confirm no short circuit between the output lines by the same method.
4. Detect the AC voltage with a multimeter at AC input terminals (INPUT) The required AC input voltage range is 380 V± 25%, or it needs to start UPS without main input.
5. Detect the DC voltage with a multimeter at input terminals (BAT.) The required battery voltage is 348 ~ 400V DC, to prevent the battery cable connection fault.

4.3.2 Single Unit Bootstrap procedure of Three-phase UPS (10~160 kVA)

The bootstrap should follow the steps as:

1. Turn on bypass power breaker (bypass):
   Power board begins to work, LCD on the panel initiate displaying. Then low battery indicator

will light on.

2. Turn on rectifier breaker (power):
   Supposing the right input power initiate rectifier automatically, the rectifier indicator (Rectifier) on panel will light on. DC voltage will be established completely after 20s time prolong, and Battery low indicator (BAT.LOW) will terminate.
3. Turn on battery breaker (battery):
   Turn on battery breaker, rectifier start to charge battery.
4. Turn on the inverter system:
   (1) FR-UK series (10~30KVA) inverter turn on steps:
   At startup, just press " "on the panel more than 1 second, DC/AC indicator on the panel will light on. After 30s, close the output breaker, then the output indicator light on, which mean the UPS inverter output normally.
5. Turn on the load：
   When the inverter output is normal, then turn on the load. Please do remember toad the alod according to this: high capacity load first, then lower capacity load.

4.3.3 Start the load

Observe the indicator on the panel to determine the operational status of UPS. When it i ndicates the UPS is in inverter working mode or battery working mode, it can supply power to the load.

After the UPS has running about 10 minutes without load, start the load. according the sequence "high-power equipment → low power equipment" .

Caution：

Some devices has large starting current which may cause overload protection (or bypass operation), it is better to start such equipment before the other devices.

4.3.4 Turn Off UPS

1.Turn off the inverter system：

(1) FR-UK sereis（10～30KVA）inverter off steps：
   Push the "OFF" button till the interter close， then the static switch will automatically transfer the inverter output to bypass output, to supply power to the load without interrupted.

(2) FR-UK sereis（40～160KVA）inverter off steps:：
   Push the " " on the panel at the same time，then the static switch will automatically transfer the inverter output to bypass output, to supply power to the load without interrupted.

2. Turn off battery breaker (battery)
   If want to turn off all UPS power, please continue to switch off battery breaker, so rectifier only stock power in DC BUS.

3. Turn off rectifier input breaker (power):
   Turn off rectifier breaker, the rectifier can not establish DC power from AC utility to DC BUS，DC BUS will discharge power slowly, it will take DC BUS about 2 minutes later.
4. Turn off bypass input breaker (bypass):
   Before switch off bypass input breaker，you have to assure output load nonuse, or there will be no power output from output terminal to terminate user equipment power at breaking bypass input breaker.

The shutting down procedure will be finished after the LCD display or LED indicators light off.

4.4 Operating procedure of Parallel System

4.4.1 Parallel System Start-up

Please keep load off before Parallel System starting up almost, and make sure all of the breaker off,

Startup steps as following:

1. Turn on the bypass breaker (BYPASS), the power board starts to working, the LCD display panel starts to display, and the BAT.LOW indicator lights on and the buzzer beeps.
2. Turn on rectifier breaker（power）of UPS1 on:
   If input phase sequence is correct, the rectifier initiates automatically, the rectifier indicator (RECTIFIER) on panel will light on. DC voltage will be established completely after 20s delay, and BAT.LOW indicator turns off and buzzer stops beeping.
3. Turn on the battery breaker (BATTERY) of UPS1:
   Turn on battery breaker, and rectifier starts to charge battery.
4. Press “ON” button on the panel, switch UPS output breaker on, UPS will come into normal invert output after 30 seconds. Use multimeter to check out if UPS output voltage and frequency are normal. Output breaker of UPS1 must be switched off renewedly after normal output! But keep UPS1 on.
5. Follow steps 1～4 above to finish the bootstrap of UPS2.Keep output breaker of UPS2 ducting until normal output of UPS2.
6. Using multimeter, measure voltage differences of double ends of breakers of output phase A 、B、C separately (breaker of UPS1 is cut-off), and the voltage differences accord with the respective differences of UPS1 and UPS2 before paralleled. If the voltage difference less than 10V, the Phase Lock of the two UPS will work normally under the Power status.
7. Cut off the AC input breakers of the two UPS , measure voltage differences of the front lines of the two UPS in the step 6 again .If voltage differences are still below 10V , the Phase Lock is working normally under the battery status.
8. Switch output breaker of UPS1 on. Measure the three-phase voltage with multimeter and output circumfluence (normal below 3A) with clip style measurer after paralleled.
   Switch the AC input breakers on, the output voltage of paralleled should be normal and output circumfluence should be below 3A.
9. If tested normally, switch load breakers of user’s distribution cabinet.
   The Parallel System can make power supply for client’s loads. The electrify sequence references require of single unit.

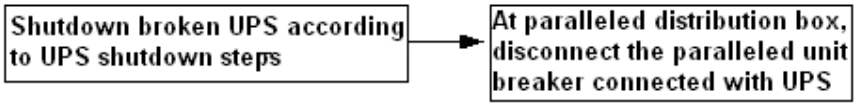
4.4.2 Parallel System Shut Down

System should not be turned On-Off frequently, or it is abnormal. and then shut down UPS Parallel system according to following sequence:

1. Shut down all the output loads of the Parallel System firstly.
2. Shut down each UPS according to the shutdown sequence of single unit by pressing the On-Off key in panel.
3. Turn off the output breaker of UPS1, and then turn off the output breaker of UPS2.(The step shall be canceled on daily operation.)

4.4.3 Online shutdown Parallel System

When a parallel unit fails, this parallel unit will quit the parallel system automatically with voice and light alarm. Now, just operate the process according to Picture 5.4-1 to make the failed unit completely quit from parallel system, and realize online warm maintenance or replacement.


Shutdown broken UPS according to UPS shutdown steps
At paralleled distribution box, disconnect the paralleled unit breaker connected with UPS

Picture 5.4-1 Online shutdown Parallel Unit

Caution：

When the parallel system is working normally, it is better not to quit its output from parallel system without shutting down parallel unit, otherwise the power system will appear abnormal.

4.4.4 Online start-up Parallel System

When online launching one or more parallel unit is needed, just follow the operation steps on Fig. 4-2, after the new unit is operating stably, it will enter parallel system automatically and realize current sharing operation.

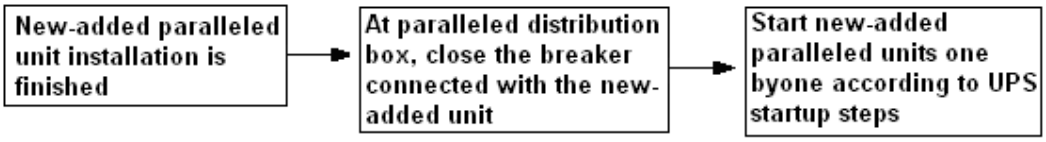

New-added paralleled unit installation is finished
At paralleled distribution box, close the breaker connected with the new-added unit
Start new-added paralleled units one byone according to UPS startup steps

Fig. 4-2 online start-up Parallel System

4.4.5 Redundancy and Expansion of Parallel System

1. Redundant Function

   When using 2+1 parallel redundant backup design, total output load should not be large than 2 times of single machine rated output. When 1 single machine fails, this single machine could launch and quit freely without affecting the operation of parallel system, so it could improve

the reliability of power system. When the output exceeds above load, the overloaded single machine (exceed N/ (N+1) times of single machine rated output) will alarm. For example, for double machines backup power system, when the load of single machine exceeds 50%, it will alarm the overloading.

2. Expansion Function

Theoretically, UPS parallel has no quantity limitation. However if the quantity is over many, the reliability of the whole parallel system will decrease on the contrary, and can not reach the aim of improving reliability. Therefore, we don't suggest using parallel mode to extend gross output power. In the application of UPS parallel system, double machines parallel is frequently used.

4.5 Manual bypass Maintenance Operation Process

Below operations are commonly handled by professionals. Manufactory will not promise to bear the responsibility of any problems caused by executing these operations by untrained and unauthorized personnel.

1. Three phases UPS FR-UK series 10-30kva Manual bypass maintenance operation step:
   (1). Press OFF button on the panel to turn off the inverter.
   (2). Wait till BYPASS light is on, shut down rectifier breaker (mains) and battery breaker (battery).
   (3) Remove the front cover closure panel to maintain a small switch, put the manual maintenance switch "ON" position, close the bypass breaker (bypass), the output breaker (output) after 1 second, after the power off 5 minutes, maintenance operation can be processed.

Caution：

It's forbidden to close output breaker (OUTPUT) when UPS maintenance.

3. After maintenance, open bypass power breaker (BYPASS), output breaker (OUTPUT). When the power supply is working normally, till bypass light (BYPASS) on the panel is on, place the manual maintenance switch on "UPS" position; here load gets power from UPS bypass electricity.
4. Then executing startup and shut down operation according to Chapter 4.3 Operation instruction.

5 Maintenance Instructions

5.1 Maintenance Guide

Correct maintenance is key to optimal operation of UPS and will prolong the equipment's life span

5.1.1 Safety Precautions

The following safe operation procedures shall be observed at any time:

1. Bear in mind that there is dangerous voltage in UPS even if it is not running. Before maintenance and adjustment, use a multimeter to check if there is existed dangerous voltage, to ensure that the power supply is switched off and it is safe for operation.
2. Do not wear gold or silver ornaments like rings and watches, etc during operation of UPS.
3. Do not take for granted the safe operation procedures. If you have any questions, please consult those who are familiar with the equipment.

5.1.2 Regular Maintenance

In order to increase the efficiency and reliability of UPS system, please carry out the following steps of preventive maintenance regularly.

1. Maintain a clean environment to avoid dust or chemical pollution to the UPS.
2. Wiring check once half a year if the input and output terminals have good contact.
3. Check regularly the operation of draught fans to prevent choking of draught. They shall be replaced in case of damage.
4. Check regularly battery voltage and UPS working status.
5. Regularly check the working status of the system to ensure timely detection of failures.

5.2 Daily maintenance of battery

1. Battery Charging requirement
   (1) When it is in first operation, please turn on the UPS to charge the batteries for 24 hours. During the charging, the UPS could be still worked, but that battery discharge time would be lower than standard value if there is a blackout.
   (2) Usually, discharge and charge the batteries per 4~6 months. Discharge the batteries to UPS shut down, then charge the batteries. The charging time should not less than 24 hours.
   (3) In high temperature area, discharge and charge the batteries per 2 months. The charging time should not less than 24 hours.
   (4) If UPS is not work for long time, it should charge the batteries every 3 months. The charging time should not less than 24 hours.
2. It can only wipe with cloth by moistening water when clean the battery case, prohibit the use of substances other than oil or organic solvents (such as gasoline and thinner).
3. Battery should be stay away from fire and all electrical equipments which is easy to creat

sparks, to aviod an explosion.

4. During the use the battery pack with UPS, it should periodically check the charger whether is OK, to avoid battery over charging for long time or in not fully charged state. To avoid excessive battery discharge, it should immediately arrange a fully charging after discharge (no later than 24 hours). Then it could be allowed to re-discharge. Strictly prohibited discharging the batteries once again if the batteries are not fully charged, otherwise it will reduce the battery capacity or even damage the battery.
5. When UPS stop working, please disconnect the battery breaker on the UPS, to avoid the battery discharge for long time when utility is failure.

5.3 Attentions when replace battery

1. Do not put batteries into fire, to avoid an explosion.
2. Do not open or disassemble a battery, the inside battery electrolyte is harmful to skin and eyes.
3. In accordance with the instructions on the battery to make the appropriate recovery.
4. For battery replacement, please consult a professional engineer.
5. Must use the batteries in same capacity, type, and battery manufacturer for replacement. The batteries are in different capacities, types and battery manufacturers are strictly prohibited to mix use.
6. Hazardous voltage may exist between battery terminals and ground. Before contact the batteries please check whether there is an existence of dangerous high voltage, to avoid any dangers to personal safety. Absolutely prohibiting contact the two terminals of battery or their bare wire ends at same time.

5.4 Troubleshooting

5.4.1 FAQ

When start-up UPS, the UPS is abnormal, please take reference of next chart 5.4-1 to find the solution. Meanwhile, please check the external environment, such as temperature, humidity are not meet the requirement or overload.

The following are simple settlement on fault. If the solution is not clear or it is no enough to solve the problems, please contact the distributor agent for detail.

Table 5.4-1 FAQ

Abnormal phenomena	Fault diagnosis and checking points	Solution
(1) RECTIFIER panel light does not light	**Rectifier AC input breaker is not open, the front panel INPUT light and RECTIFIER light does not light, FAULT light is on.**	**Open rectifier AC input breaker**
	Rectifier input voltage is not within the normal range, front panel RECTIFIER light does not light, FAULT light is on.	**Input the voltage which is within the rectifier normal working**
(2) Phase sequence panel lights, the buzzer beeps long time	**AC input phase is wrong, LCD will display wrong message, front panel phase sequence (PHASE) light is on, the buzzer beeps long time**	**Change the rectifier AC input line phase sequence, usually exchange any two of U, V, W will be ok.**

(3) No output of Inverter, the buzzer beeps long time, FAULT lights	**Rectifier has not started completely. the buzzer beeps long time, the battery under-voltage light is on.**	**Please wait for the rectifier starting finished, the Buzzer beeps lifted.**
	Output load is overload. OVERLOAD lights.	**Reduce UPS load**
(4) Main failure, UPS crash without output.	**Battery circuit is abnormal**	**Check if the battery circuit switch is normal or if the battery is damaged。**
(5) LCD&LED lights are not light	**UPS breakers are not open**	**Open any breakers of UPS in the front panel**
	Power board failure	**It should be maintained by professional service personnel.**
(6) Fan stops rotating	**Phase V output voltage is abnormal, fan failure.**	**It should be maintained by professional service personnel.**
(7) FAULT lights ,the buzzer beeps long time	**Outputs are short circuit (short circuit containing the load itself).**	**Lift short-circuit point, close the UPS inverter, restart the inverter.**
	Inverter heatsink over-temperature	**Reduce the load, or load evenly**
	The fuse on the inverter is broken, or IGBT module is abnormal	**Replace the fuse or IGBT modules.**
	Battery discharge occurs under-voltage protection	**Re-start automatically when main input**
(8) OVERLOAD light is on	**UPS output overload**	**Reduce the load**
(9) The power supply couldn't transfer from inverter to bypass when UPS is shutdown	**If bypass power supply input voltage, frequency is normal**	**Check the bypass power supply voltage and frequency**
	Bypass / Inverter SCR driver board failure.	**It should be maintained by professional service personnel.**
(10) The power supply couldn't transfer from bypass to inverter when UPS starts	**Inverter failure**	**It should be maintained by professional service personnel.**
	Bypass / Inverter SCR driver board failure.	**It should be maintained by professional service personnel.**
(11) Communication is Abnormal	**Communication cable is inserted into the wrong place**	**Insert the communication cable correctly**
	Communications software is not installed successfully.	**Install the software correctly**
	Computer communication windows are set incorrectly	**Set the communication port correctly**
	Above problems are ruled out, still can not communicate properly.	**It should be maintained by professional service personnel.**

5.4.2 Troubleshooting for single system and parallel system

1. Single system troubleshooting.
   When the single unit fails, shut down the UPS power via "OFF" button on UPS panel. If it is necessary to shut down the user loads, disconnected the UPS input / output breakers, to ensure that UPS will not be damaged any more.
2. When the host unit fails, how to deal with series back up system? How to deal with it if the redundant unit fails?
   When the host unit fails, shut down the host UPS power via "OFF" button on UPS panel. Meanwhile, disconnected the host UPS input / output utility and battery breakers, and contact with engineer for maintenance.
   When the redundancy unit fails, shut down the redundant UPS power via "OFF" button on

UPS panel. Meanwhile, disconnected the redundant UPS input / output utility and battery breakers, and contact with engineer for maintenance.

3. How to deal with the failure from Parallel system?

   When one unit from the parallel system fails, shut down this failed UPS power via “OFF” button on UPS panel. Meanwhile, disconnected this failed UPS input / output utility and battery breakers, and contact with engineer for maintenance.

6. Panel LCD Display Operation Procedure

6.1 Push Key Function Illustration

There are 5 kinds of functions keys, as following：

This key is “ display upward / parameter setting +”function repeat.
Add parameter at parameter setting.

Push this key mean“ display downward / parameter set.
For multi-lines character display, downward browsing.
At parameter setting, reduce parameter.

Push this key mean “Parameter item set”
For multi-item set in the same page, using this key can alter display.

Push this key to confirm the function.
To confirm the option with“>” mark or parameter set.

Push this key to back to previous page.
For back to upper level operation menu or parameter setting without input.
Push to Light the LCD.

6.2 On/Off Operation

6.2.1 On/Off Operation of Three-phase (10~30 kVA) UPS

On/Off keys of this Series UPS:

Power on ---- Press “

” key about 1s

Power off ---- Press “

” key about 1s

6.2.2 On/Off Operation of Three-phase (40~160 kVA) UPS

This series have “ double buttons combination operation” to prevent the wrong operating.

They lie on the panel as：“
”

Startup ---- press “
” for more than 1s.

Shut down ---- press “ ” for more than 1s.

6.3 Display and Related Operation

1. Close the UPS bypass breaker, and connect mains power supply, panel display as:

```
Welcome to use KELONG  UPS

Machine model: FR-UK3320
Rating input : 380V/50Hz
Rating output: 380V/50Hz
XIAMEN KEHUA HENGSHENG CO.,LTD

>>>>>>>>>>>>>>>>>>>>==============
```

It will return to normal standard page after 10seconds. It also can be realized by pressing button “ ” to return normal page directly.

2. Password page to turn on the UPS:

```
KELONG UPS

Enter Password
Password: 0000
```

Input password to enter the main display page, if password input is error, it will enter the display page to show you that the password is wrong, shown as follow:

```
KELONG UPS

Wrong Password
Password: 0000
```

3. Main display page:

```
 KELONG UPS

Output     R       S       T
Vl-n:    220V    220V    220V
I-n:       0A      0A      0A
Load:      0%      0%      0%

UPS status:      Normal
01-01-2006        08:00:00
```

UPS operation statue as below：

Power off, Normal, Rectifier abnormal, protecting, battery checking, Bypas abnormal, Overload, Battery testing, Battery Reversal, Parallel cable abnormal, Battery low, Load warning, Battery ok, Battery capacity down, battery change suggestion, due time of trail, Due time of off, fan failure, EPO startup, Battery return circuit abnormal and maintenance bypass start, etc..

Then, press X and X at the same time, LCD will display “Setting mode page”, and indicate user to enter password. Press X or X can change value of cursor site, press to move cursor.

Then press the “ ” “ ” buttons at the same time, it will turn to the process setting page, and shows “Please enter the password ”, then press bottons “ ” or “ ” , which could set the cursor position data according to moving the “ ” button.

4. Process password setting page

```
KELONG UPS
Settings
password: 000000
```

If the password is right, it will enter to the process setting page; if the password is wrong, it will enter to the page which show to you the password is wrong, as follow:

```
KELONG UPS
Settings
Wrong password!

password: 000000
```

5. Process setting page:

```
KELONG UPS
settings
▸ Parameters
Battery
Extra
adjust
```

Choose the cursorposition “►”show to the menue，press the” ”to referring page:

(1) Parameter setting page

Choose the parameter page，as below：

```
      Settings-UPS
Model selecting :◂  FR-UK33xx
HalfLoad warning:  On
Output voltage:   220V
Output frequency: 50Hz
Bypass voltage:   +15%/-25%
Bypass frequency: +5%/-5%
```

Menu Options as follows:

Model: FR-UK33xx(xx＝10，15，20，30，40，50，60，80，100，120，160，200，250，300，320，400)

Output Voltage Setting: 220V/230V/240V

Output frequency Setting: 50Hz/60Hz

Bypass voltage range: +15%/-25%、+20%/-25%

Bypass frequency range: +5%/-5%、+10%/-10%

Under this page, Push “ ”key to select the Parameter item lying on where cursor “”point to. Push “ ” key means the cursor downward, and vice versa. Push “ ” key means the cursor upward. Push “ ” key to save it after setting finished and return to the previous page. Push “ ” key to return directly to the previous page without saving the setting, the same below.

(2) Battery page

By selecting the battery page, displays as below:

```
      Settings-Battery
Elapsed capacity: ◂  0Ah
Battery capacity:  0100Ah
Boost charge adjust:  0V
Float charge adjust:  0V
                      ▼
```

Entering this page, Ah parameters can be set when the cursor “-” in the position as shown. Push “ ” key to exit this page without saving the setting, push “ ” key to saving the setting and the cursor will turn to “◂ ” and jump to the “Boost charge adjust” setting. At the moment, push “ ” key to set the parameter of “Boost charge adjust” and “Float charge adjust”(-5V—+5V)，The cursor “▼” means there is the next page expanded, including as below:

Battery sessions settings: 29 / 30pcs

Battery Replacement Reminder: On / Off

Please set the number of years: 3 years (1 to 10 years optional)

If the setting of “battery replacement reminder” is off, the option of “Please set the number of years” is automatically hidden.

(3) Extra page

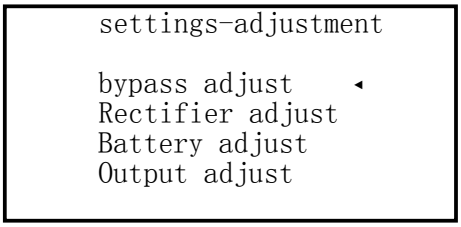
```
      Settings-Extra

Clear history log: ◂ On
ECO mode setting:    On
Maintenance mode:    On
S/N reentering:      On
```

The above settings can select to be set “Off”.

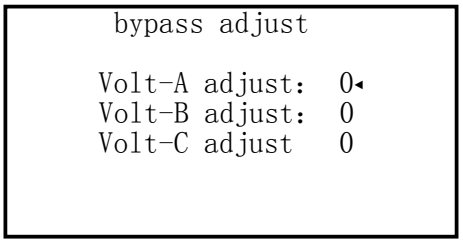
When “Clear history log” is set “On”, it will return to some column of records. Push “ ” and “ ” keys to delete the record. When the “Clear history log” is set “Off”, then the record can not be deleted.

(4) Adjustment page



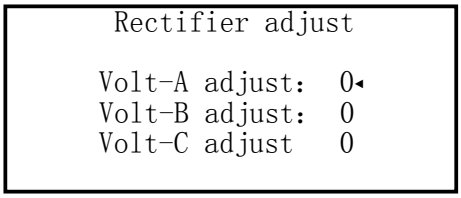
Push “ ”key to move the cursor.

① Bypass adjust page:



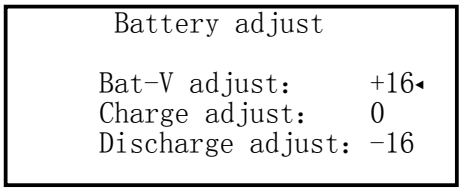
Push “ ” key to move the cursor and select the menu, push “ ” key to operate the adjustment.

② Rectifier adjust page:



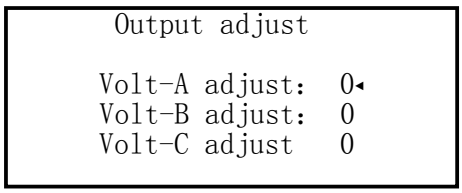
Push “ ” key to move the cursor and select the menu, push ” key to operate the adjustment.

③Battery adjust page:



Push “ ” key to move the cursor and select the menu, push “ ” key to operate the adjustment.

④Output adjust page:



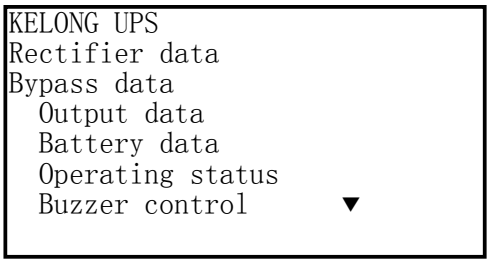
Push “ ” key to move the cursor and select the menu, push “ ” key to operate the adjustment.

The above adjustable range: {"-16"},{"-15"},{"-14"},{"-13"},{"-12"},{"-11"}, {"-10"},{"-9"}, {"-8"},{"-7"},{"-6"},{"-5"},{"-4"},{"-3"},{"-2"},{"-1"},{"0"}, {"+1"},{"+2"},{"+3"},{"+4"}, {"+5"},{"+6"},{"+7"},{"+8"},{"+9"},{"+10"}, {"+11"},{"+12"},{"+13"},{"+14"},{"+15"},{"+16"}.

Caution: -16 to +16 represents the adjustable level, not sure for the number of adjustable volume.

6. Function menu page:

Under the normal display page, push “ ” key to display the function menu list of UPS. "►" mark means the currently selected function.



The menu also lists the following options: Battery management, Language setting, Time setting, Manufacturer information, Historical event, Password management.

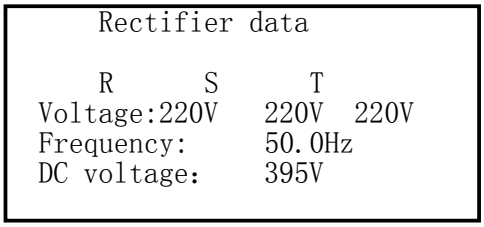
Push “ ” or “ ” key to move “►” mark to the selection in menu. “▲,▼” displayed on right up or down of screen stands there is still some matter for up or down rolling.

Push “ ” key into the menu with “►” mark.

Push “ ” key to turn in output parameter normal display page.

(1) Rectifier data page:

This page displays UPS rectifier 3 phases input voltage, frequency and rectifier DC output voltage.



Push “ ” key to back upper menu. Other keys are negative.

(2) Bypass data page:

This page displays UPS bypass 3 phases voltage and frequency.

```
        Bypass data

      R       S       T
Voltage:220V   220V  220V
Frequency:      50.0Hz
```

Push “ ” key to back upper menu. Other keys are negative.

(3) Output data page:

This page displays UPS 3 phases output voltage and LOAD percentage for each phase.

```
Output     R       S       T
Vl-n:    220V    220V    220V
I-n:       0A      0A      0A
Load:     20%     20%     20%
P(kW):    0.0     0.0     0.0
S(kVA):   0.0   0.0     0.0
PF:       0.00    0.00    0.00
Frequency:  0.0Hz
```

Push “ ” key to back upper menu. Other keys are negative.

(4) Battery data page:

This page displays UPS battery voltage and charging/discharging current. When UPS in normal status, displaying charging current; When UPS in inverting status, displaying discharging current.(If Ah number of discharge is 0 in the program setting, “Discharge time ” and “Remaining time” will not display)

```
KELONG UPS
Battery data
Battery voltage:    384V
Discharge current:   10A
Battery temperature: 30℃
Discharge time:    1H.30M
Remaining time:     1H.30M.
```

Push “ ” key to back upper menu. Other keys are negative.

(5) Operating status page:

This page displays all UPS operating status.

```
KELONG UPS
Operating status

Phase input     :   Normal
Bypass status   :   Normal
Rectifier status:   Normal
Battery status  :   Normal
                        ▼
```

By the way, there are two lines in this page. Displayed by the mark at right down of screen.

INVERTER STATUS: NORMAL

OUTPUT STATUS: NORMAL

LOAD STATUS: NORMAL

TEMPERATURE: 26□

INVERTER TEMPERATURE: NORMAL

PARALLEL LINE STATUS: NORMAL

BATTERY POLAR: NORMAL

FUSE STATUS: NORMAL

FAN STATUS: NORMAL

Push “ ” or “ ” keys to browse by scroll.

Push “ ” key to back upper menu. Other keys are negative.

(6) Buzzer control page

This Series offer UPS silence control ability. When UPS stay in no utility input status, user can buzz off intermission beeping. But if abnormal status initiated, buzzer will start alarming automatically without shield control.

```
KELONG UPS
Buzzer control

Buzzer:   ◂    On
```

Push “ ” key to control the buzzer on or off.

Push “ ” key to back upper menu. Other keys are negative.

(7) Battery management page

This Series supply UPS battery test function, the principle is reducing the DC output voltage of the rectifier, to make UPS battery a instant discharging, then to test battery validity under a long term utility status.

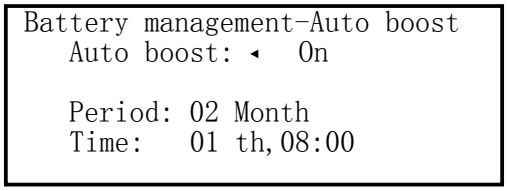
```
KELONG UPS
Battery management

▶ Manual test
  Auto boost
```

Expanding submenu as below:

```
Battery management-Manual test
          Test:Off

        ▶ Abort
          Standard
          Deep
```



Entering this page, push “ ” key to control “Auto boost” on or off.

When selecting the Auto boost “off”, push “ ” key to confirm it and exit the page.

When selecting the Auto boost “on”, there are popups of “Period” and “Time” setting. At the moment, push “ ” key, the cursor“◄” change to “-” and the display jumps to “Time” setting, then “Period” and “Time” can be set. Push “ ” key to save it after setting finished.

(8) Language setting page

This page is for UPS display language switch setting in Chinese/English/Spanish.

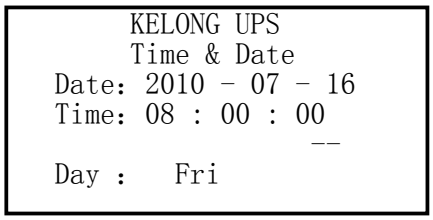
Push “ ” or “ ” keys to control the mark selecting language in Chinese/English/ Spanish.

Push “ ” key to confirm the selected status.

Push “ ” key to back upper menu. Other keys are negative.

(9) Time setting page：

This Series UPS equipped with timer chip. It can show the present time. On this page, user can adjust time through the UPS timer chip.



Push “ ” key to control the mark selecting in Year /Month/Day/Hour/Minute/Second.

Through button “ ” or “ ” to increase or decrease both.

Through key “ ” to confirm the modified time parameter and write in the clock chip inside the UPS. The cursor “-“ changes to “◄”, and jumps to the line of “Week”, press “ ” to choose

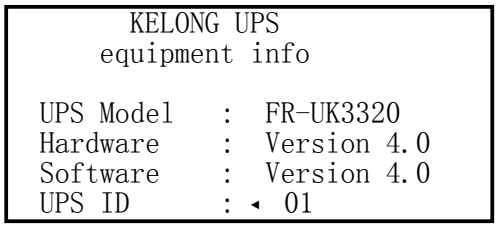
the settings.

Through key “ ”, return to the upper menu page.

(10) Manufacturer Information Page:

This page shows the manufacturer of UPS, model name, version no. and ID address no. of the device.

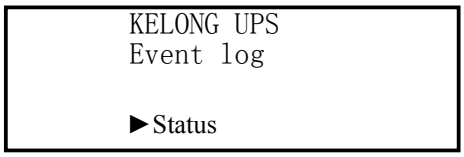
There into, ID address no. is the address coding information of communication data frame when UPS is using RS485 multi-machine network monitoring. It could be set through a group of dial switches inside the UPS. Generally we do not propose to change the parameter randomly.



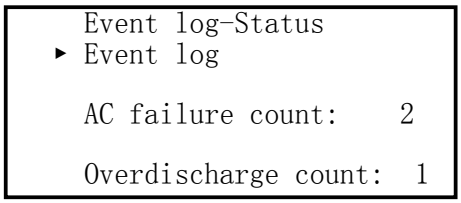
Press “ ”, to set UPS ID, through“ ”, key, return to the upper menu page. Other buttons are all invalid.

（11）History Log Page:

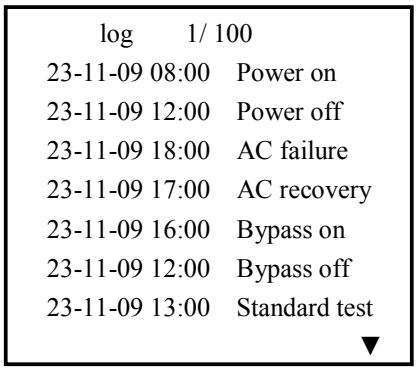
This page includes the records and displays of some important history parameters of UPS and their occurrence time. It could provide data references to the later analysis of local grid conditions and abnormal situation.



After pressing “ ”, to choose “Status”, the page is below:



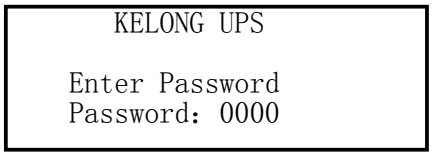
After pressing “ ” to choose “History log”, the page is below:



“History log” could also record below information:

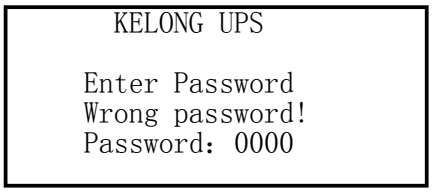
UPS starting up, UPS shutdown, AC fail, AC recovery, bypass on, bypass off, AC voltage, AC frequency, bypass voltage, bypass frequency, output voltage, output frequency, output load (the percentage of overload records), battery test type (standard / depth test), the battery test duration time, battery low voltage, input phase abnormality, inverter over-temperature, rectifier over-temperature, fuse abnormality, parallel lines abnormality, fan working abnormal, rectifier abnormality, inverter abnormality, EPO open, battery circuit abnormality, maintenance bypass open, X-phase over-current, etc. If there is no record, it shows: no related record.

(12) Password Management Page:

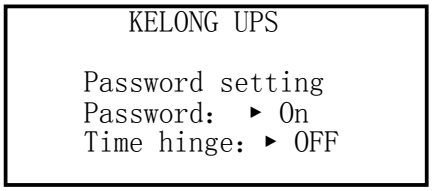


The entering way of the password is the same as the project settings.

The page of entering wrong password:



The page of entering correct password:



Press “ ” and “ ” to choose the open or closed of boot password and time off. When the boot password open, turn off and then turn on the electricity again, it will enter to “2. Boot Password Page”. If there is no password or the password is wrong, it can’t be started through panel power button. If the password is closed, it will directly enter “3. Main Display Page” from boot page. Timing off will be activated when the boot password is open.

7 Communication Interface Connection Way

7.1 RS232 Communication

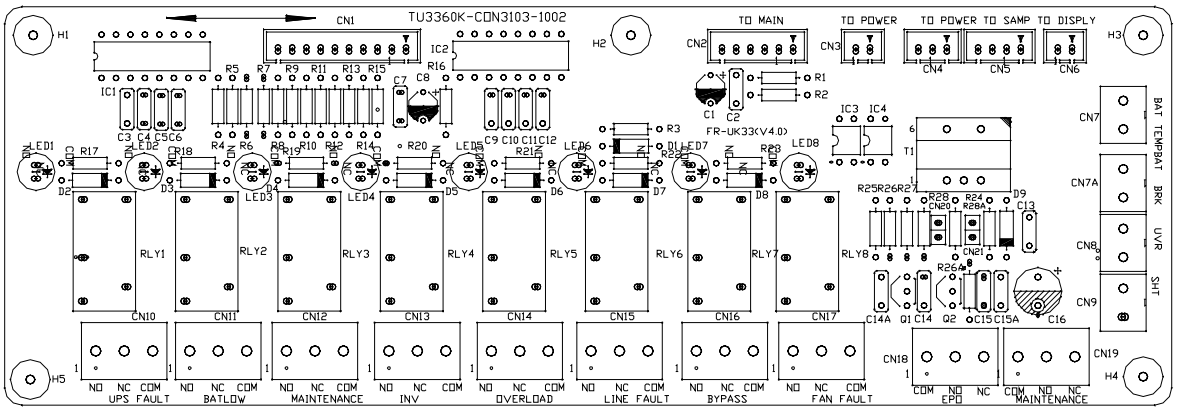
Open the front panel air switch cover, there is a RS232/RS485 communication interface on the front panel. It could be connected with the optional KELONG UPS monitoring software, SNMP card, which support short-distance communication to UPS (generally less than 10m); to realize the remote monitoring of the parametric of UPS input voltage and frequency, output voltage and frequency, load, and etc.

7.2 RS485 Communication

Open the front panel air switch cover, there is a RS232/RS485 communication interface on the front panel, which supports long-distance communication. It realizes the remote monitoring of the parametric of UPS input voltage and frequency, output voltage and frequency, load, and etc., and realizes the remote operation of boot and shutdown.

7.3 Dry Contact Communication

Open the front panel air switch cover, there is a dry contact communication panel on the front panel, shown as below:



The instruction of the external Interface signal of the dry contact communication panel:

1. CN10 (UPS FAULT SIGNAL):

   When UPS inverter, rectifier or bypass system fails, COM and NO close, indicator light LED1 is on;

   When UPS is under normal working status, COM and NC close, indicator light LED1 light is off;

2. CN11 (BAT. LOW SIGNAL):

When battery under voltage alarms, COM and NO close, indicator light LED2 is on; on the contrary, COM and NC close, indicator light LED2 is off.

3. CN12 (BYPASS MAINTENANCE SIGNAL):

When UPS is under bypass maintenance status, COM and NO close, indicator light LED3 is on; on the contrary, COM and NC close, indicator light LED3 is off.

4. CN13 (INVERTER SIGNAL):

When UPS is under inverter working status, COM and NO close, indicator light LED4 is on; when the inverter stops working, COM and NC close, indicator light LED4 is off.

5. CN14 (OVERLOAD SIGNAL):

When UPS is overload, COM and NO close, indicator light LED5 is on; when UPS resumes normal working, COM and NC close, indicator light LED5 is off.

6. CN15 (LINE FAULT SIGNAL):

When mains is abnormal, COM and NO close, indicator light LED6 is on; when mains input is back to normal, COM and NC close, indicator light LED6 is off.

7. CN16 (BYPASS SIGNAL):

When UPS is under bypass working status, COM and NO close, indicator light LED7 is on; when UPS is under inverter working status, COM and NC close, indicator light LED7 is off.

8. CN17 (FAN FAULT SIGNAL):

When fan fails, COM and NO close, indicator light LED8 is on; when fan is working normally, COM and NC close, indicator light LED8 is off.

9. CN18 (External Connection of Emergency Power Off Control Signal)

User could connect COM and NO, COM and NC signal interfaces based on needs. Factory setting requests external EPO signal to connect between N0 and COM. If user needs to use NC signal, CN20 short connector on the panel should be cancelled, and then connect the external EPO signal between NC and COM.

10. CN19 (External Connection of Maintenance Bypass Control Signal)

User could connect COM and NO, COM and NC signal interfaces based on needs. Factory setting requests external maintenance bypass signal to connect between N0 and COM. If user needs to use NC signal, CN21 short connector on the panel should be cancelled, and then connect the external maintenance bypass switch control signal between NC and COM.

11. CN7 (Battery Box Temperature Detection Signal Interface):

This interface is used to detect the battery temperature of battery cabinet.

12. CN7A (Air Switch Detection Signal of Battery Cabinet)

This interface is used to detect the air switch on/off signal of battery cabinet.

13. CN8 (Release Signal of Battery Air Switch Under Voltage)

With the use of this signal and battery circuit air switch, it could control battery air switch on/off.

14. CN9 (Battery Air Switch SHT Signal)

With the use of this signal and battery circuit air switch, it could control battery air switch on/off.

Appendix A
Package, Transportation and Storage

A.1 Package

UPS packed by carton. Packaging should pay attention to the direction of demands placed on various parts. The side of boxes printed “avoid of wet , handle with care, this side up, stacking layers limits and other warning patterns, also with UPS model and other information. Positive Carton printed with Kehua logo.

A.2 Transportation

It should strictly conform to the care signs during transportation, and place the UPS according to the care signs, to avoid the shake to the UPS. It can’t put the equipment on the open vehicle and cabin, and should be put together with flammable articles. It is prohibited to put the equipment in the open air in the midway, and should avoid the drench of the rain, snow or other wet goods, also machinery damage.

A.3 Storage

Place the equipment according to the care signs. It should part from ground for 20cm, part from wall, hot source, cold source, windows or air entrance for 50cm.

Environment temperature for storage is 0～40℃, relative humidity is 20%～80%, the stock should not have any baleful gas, flammable and corrosive chemistry, have not strong shake, strike and magnetic field. The storage period in this condition is for six months, over six months, the equipment should be checked, and charged the battery every three months.

Appendix B
Toxic and Hazardous Substances or Elements Table

Toxic and hazardous substances or elements declaration						
Material part name	**Toxic and hazardous substances or elements**					
	Pb	**Hg**	**Cd**	**Cr^{6+}**	**PBB**	**PBDE**
Case, cabinet (metal parts)	○	○	○	○	○	○
Line bar, connector, groove	×	○	○	○	×	×
Switch, relay	×	○	○	×	×	×
Cable, wire	×	○	○	○	○	○
Radiator	○	○	○	○	○	○
PCB board	×	○	○	○	○	○
Transformer	×	○	○	○	○	○
LCD	×	○	○	○	○	○
Label	○	○	○	○	○	○
Carton	○	○	○	○	○	○
Wooden case	○	○	○	○	○	○
Battery（when applicable）	×	○	○	○	○	○
Semi-conductor	×	○	○	○	○	○
Contactor（when applicable）	×	○	×	○	○	○

1. ○ & × meaning:

   ○：The hazardous substance in all homogeneous materials in the parts are within the limit requirement according to standard SJ/T-11363-2006

   ×：The hazardous substance at least in some homogeneous material in the parts are within the limit requirement according to standard SJ/T-11363-2006

2. Instruction for "×" technical reasons as follows:

   ① Pb-free solder joints is poor than with lead solder joint.

   ② According to the current battery technology, only the lead battery available (lead battery plates), Compliance with EU battery directive.

   ③ Stock plastic material part of the element is not complied with RoHS, but we are updating them.